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(71) Applicant *(for all designated States except US)*: THE GLAD PRODUCTS COMPANY [US/US]; 1221 Broadway, Oakland, CA 94612 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: SAVICKI, Alan, F., Sr. [US/US]; 577 Beaconsfield Avenue, Naperville, IL 60565 (US).

(74) Agents: AUGUSTYN, John, M. et al.; Leydig, Voit & Mayer, LTD., Two Prudential Plaza, Suite 4900, 180 North Stetson, Chicago, IL 60601-6780 (US).

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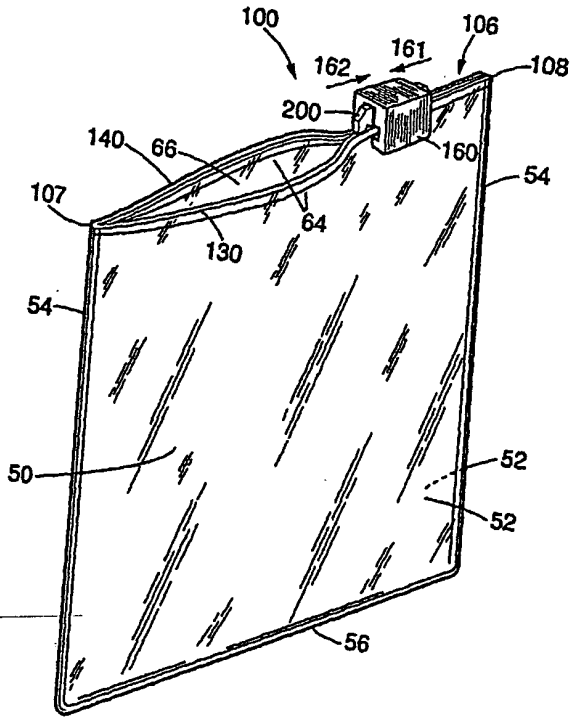
(54) Title: CLOSURE DEVICE



(57) Abstract: The closure device (100) includes interlocking fastening strips (106) and a slider nember (160) slidably disposed on the fastening strips for facilitating the occlusion and deocclusion of the fastening strips when moved towards first and second ends thereof. A locking mechanism (200) is disposed on the slider member (160) for movement between a deactivated position and an activated position. In the deactivated position, the locking mechanism (200) is disposed to freely move along the fastening strips (106) in a substantially non-interfering manner. In the activated position, the locking mechanism (200) is disposed to engage one of the fastening strips (106) so as to restrict movement of the slider member (160) with respect to the fastening strip.

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CLOSURE DEVICE

FIELD OF THE INVENTION

The present invention relates generally to closure devices and, more particularly, to a closure device with interlocking fastening strips and an associated slider member. The inventive closure device may be employed in traditional fastener areas, and is particularly well suited for fastening flexible storage containers, including as plastic bags.

BACKGROUND OF THE INVENTION

The use of closure devices for fastening storage containers, including plastic bags, is generally well known. Furthermore, the manufacture of closure devices made of plastic materials is generally known to those skilled in the art, as demonstrated by the numerous patents in this area.

A particularly well-known use for closure devices is in connection with flexible storage containers, such as plastic bags. In some instances, the closure device and the associated container are formed from thermoplastic materials, and the closure device and the side walls of the container are integrally formed by extrusion as a single piece. Alternatively, the closure device and side walls of the container may be formed as separate pieces and then connected by heat sealing or any other suitable connecting process. In either event, such closure devices are particularly useful in providing a closure means for retaining matter within the bag.

Conventional closure devices typically utilize mating male and female fastening strips or closure elements which are used to selectively seal the bag. With such closure devices, however, it is often difficult to determine whether the fastening strips are fully occluded. This problem is particularly acute when the strips are relatively narrow. Accordingly, when such fastening strips are employed, there exists a reasonable likelihood that the closure device is at least partially open.

Such fastening strips devices are also particularly difficult to handle by individuals with limited manual dexterity. Thus, in order to assist these individuals and for ease of use by individuals with normal dexterity, the prior art has also provided sliders for use in opening and closing the fastening strips, as disclosed, for example, in U.S. Patent Nos. 4,199,845, 5,007,142, 5,007,143, 5,010,627, 5,020,194, 5,070,583, 5,283,932, 5,301,394, 5,426,830, 5,431,760, 5,442,838, and 5,448,808. Some of these sliders include a separator finger which extends at least partially between the fastening strips. When the slider is moved in the appropriate direction, the separator finger divides the fastening strips and opens and the bag.

In order to prevent the slider from traveling off of the ends of the fastening strips, some closure devices are provided with protruding end stops, clips, clamps, or similar retaining structures, as disclosed, for example, in U.S. Patents Nos. 5,067,208, 5088,971, 5,131,121, 5,161,286, 5,189,764, 5,405,478, 5,442,837, 5,488,807, and 5,482,375. Such retaining structures are formed or attached near either end of the fastening strips and typically involve rather complex manufacturing processes

and/or structure which significantly increases the overall cost of the closure device. Indeed, the prior art has failed to afford a closure device which reliably and inexpensively prevents the slider from traveling past the ends of the fastening strips without the use of associated stops, clips, clamps, or similar retaining structures affixed to the ends thereof.

OBJECTS OF THE INVENTION

Accordingly, a general object of the present invention is to provide a closure device which overcomes the deficiencies of the prior art.

A more specific object of the present invention is to provide a closure device which reliably prevents a slider from traveling off of the ends of affiliated fastening strips without the use of end stops, clips, clamps, or similar structures affixed to the ends thereof.

A related object of the present invention is to provide a closure device which conveniently retains the slider on the fastening strips without the use of end stops, clips, clamps, or the like.

Another object of the present invention is to provide a closure device which retains the slider in a position between the ends of the fastening strips.

A further object of the present invention is to provide a closure device having the foregoing features which is reliable, durable, and convenient to use.

SUMMARY OF THE INVENTION

Accordingly, a closure device is provided which

accomplishes these and other objects and overcomes the above-identified drawbacks of the prior art. As is customary in the art, the inventive closure device is intended for use with a storage container which includes a pair of complementary sheets or opposing flexible side walls, such as a plastic bag. The inventive closure device includes interlocking fastening strips disposed along respective edge portions of the opposing side walls, and a slider member slidably disposed on the interlocking fastening strips for facilitating the occlusion and deocclusion of the fastening strips when moved towards first and second ends thereof. In accordance with the present invention, a locking mechanism is adjustably disposed on the slider member for movement between a deactivated position and an activated position. In the deactivated position, the locking mechanism is disposed to freely move along the interlocking fastening strips in a substantially non-interfering manner. In the activated position, however, the locking mechanism is disposed to compressibly engage or grip the interlocking fastening strips so as to restrict movement of the slider member with respect to the fastening strips.

These and other objects, features, and advantages of the present invention will become more readily apparent upon reading the following detailed description of exemplified embodiments and upon reference to the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a storage container in the form of a plastic bag utilizing a closure device

having interlocking fastening strips, a slider member, and a locking mechanism constructed in accordance with the teachings of the present invention;

FIG. 2 is a partial top plan view of the storage container and closure device depicted in FIG. 1;

FIG. 3 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 3-3 in FIG. 2, and showing a first embodiment of the locking mechanism in a deactivated position;

FIG. 4 is a partial fragmentary, cross-sectional view similar to FIG. 3, but showing the slider at one end of the interlocking fastening strips and the locking mechanism in an activated position;

FIG. 5 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 5-5 in FIG. 2, and showing a second embodiment of the locking mechanism in the deactivated position;

FIG. 6 is a partial fragmentary, cross-sectional view similar to FIG. 5, but showing the locking mechanism in the activated position;

FIG. 7 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 7-7 in FIG. 2, and showing a third embodiment of the locking mechanism in the deactivated position;

FIG. 8 is a partial fragmentary, cross-sectional view similar to FIG. 7, but showing the slider at one end

of the interlocking fastening strips and the locking mechanism in the activated position;

FIG. 9 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 9-9 in FIG. 2, and showing a fourth embodiment of the locking mechanism in the deactivated position;

FIG. 10 is a partial fragmentary, cross-sectional view similar to FIG. 9, but showing the slider at one end of the interlocking fastening strips and the locking mechanism in the activated position;

FIG. 11 is an enlarged, partial fragmentary, top plan view as seen from above in FIG. 2, and showing a fifth embodiment of the locking mechanism in the deactivated position;

FIG. 12 is a partial fragmentary, top plan view similar to FIG. 11, but showing the slider at one end of the interlocking fastening strips and the locking mechanism in the activated position;

FIG. 13 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 13-13 in FIG. 2, and showing a sixth embodiment of the locking mechanism in the deactivated position;

FIG. 14 is a partial fragmentary, cross-sectional view similar to FIG. 13, but showing the slider at one end of the interlocking fastening strips and the locking mechanism in the activated position;

FIG. 15 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 15-15 in FIG. 2, and showing a seventh embodiment of the locking mechanism in the deactivated position;

FIG. 16 is a partial fragmentary, cross-sectional view similar to FIG. 15, but showing the slider at one end of the interlocking fastening strips and the locking mechanism in the activated position;

FIG. 17 is an enlarged, partial fragmentary, cross-sectional view as seen in the direction of line 17-17 in FIG. 2, and showing an eighth embodiment of the locking mechanism in the deactivated position;

FIG. 18 is a partial fragmentary, cross-sectional view similar to FIG. 17, but showing the slider at one end of the interlocking fastening strips and the locking mechanism in the activated position;

FIG. 19 is an enlarged, partially fragmentary, cross-sectional view of a first embodiment of the interlocking fastening strips as seen in the direction of line 19-19 in FIG. 2;

FIG. 20 is an enlarged, partially fragmentary, cross-sectional view of a second embodiment of the interlocking fastening strips as seen in the direction of line 20-20 in FIG. 2;

FIG. 21 is an enlarged, partially fragmentary, cross-sectional view of a third embodiment of the interlocking fastening strips as seen in the direction of

line 21-21 in FIG. 2; and

FIG. 22 is an enlarged, partially fragmentary, cross-sectional view of a fourth embodiment of the interlocking fastening strips as seen in the direction of line 22-22 in FIG. 2.

While the present invention will be described and disclosed in connection with certain embodiments and procedures, the intent is not to limit the present invention to these embodiments and procedures. On the contrary, the intent is to cover all such alternatives, modifications, and equivalents that fall within the spirit and scope of the present invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Turning now to the drawings, a closure device constructed in accordance with the present invention is generally designated by reference numeral 100. As best shown in FIGS. 1 and 2, the inventive closure device 100 is intended for use with a storage container, such as a conventional plastic bag 50. The bag 50 includes a pair of complementary sheets or opposing flexible side walls 52 which are attached at lateral and bottom sides 54 and 56, respectively, to form a storage compartment. The complementary sheets 52 include upper edge portions 64 which define a mouth 66 for the bag 50. Although a rectangular plastic bag 50 is specifically depicted herein, it will be readily appreciated by those skilled in the art that other bag shapes and materials may alternatively be used without departing from the scope or spirit of the present invention.

In the illustrated embodiment, the closure device 100 comprises a pair of interlocking fastening strips 106 disposed along the upper edge portions 64 of the side walls 52, and a slider member 160 carried by both interlocking fastening strips 106. More specifically, a first fastening strip 130 is disposed along the upper edge portion 64 of one of the side walls 52, an affiliated second fastening strip 140 is disposed along the upper edge portion 64 of the other side wall 52, and the slider 160 straddles both the first and second fastening strips 130 and 140. Both the first fastening strip 130 and the second fastening strip 140 include an upper outward surface 122 and an external side portion 126.

In keeping with a general aspect of the present invention and as will be described in greater detail below, the interlocking fastening strips 106 of the present invention may be of virtually any type or form including, for example: (1) shear action or Z-axis closure strips as shown herein at FIG. 19; (2) U-channel closure strips as shown herein at FIG. 20; (3) arrowhead-type closure strips, as disclosed in U.S. Patent Nos. 5,007,142, 5,020,194, and as shown herein at FIG. 21; and/or (4) rolling action closure strips, as disclosed in U.S. Patent No. 5,007,143, and as shown herein at FIG. 22. All of the above-identified patents and applications are hereby incorporated by reference in their entireties.

In use, the slider member 160 of the present invention facilitates the occlusion and deocclusion of the interlocking fastening strips 106 when moved in the appropriate direction along the strips 106. In particular, the slider member 160 facilitates the occlusion of the interlocking fastening strips 106 when

moved towards a first end 107 thereof, and facilitates the deocclusion of the interlocking fastening strips 110 when moved towards a second end 108 thereof. For example, when the slider 160 is moved in an occlusion direction, as indicated by reference numeral 161 in FIGS. 1 and 2, it facilitates the closure of the fastening strips 106. Conversely, when the slider 160 is moved in a deocclusion direction, as indicated by reference numeral 162, it facilitates the separation of the fastening strips 106. As best shown in FIG. 1, the first and second ends 107 and 108 of the interlocking fastening strips 106 correspond to, and are aligned with, the two lateral sides 54 of the opposing flexible side walls or sheets 52.

The slider member 160 comprises a housing 170 which may be molded from any suitable plastic material. As best shown in FIGS. 19-22, the housing 170 includes a top portion 172, a pair of spaced-apart side portions 174, and an internal void 176 between the side portions 174 for receiving the interlocking fastening strips 110. As shown in FIGS. 19 and 20, the housing 170 may also include a bottom portion 178 with a slot 179 formed therein for receiving the upper edge portions 64 of the complementary sheets 52. As will be understood by those skilled in the art, the housing 170 may further include a separator finger or other structure 182 which extends downwardly into internal void 176 between side portions 174, as shown, for example, in FIGS. 21 and 22. In use, 106 finger 182 provides for the separation of the interlocking fastening strips 106 when the slider member 160 is moved in the deocclusion direction 162, as disclosed, for example, in U.S. Patent Nos. 5,007,142, 5,007,143, 5,010,627, 5,020,194, 5,067,208, 5,070,583, 5,088,971,

5,131,121, 5,161,286, 5,189,764, 5,282,932, 5,301,395, 5,426,830, 5,448,808, and 5,442,837.

In accordance with an important aspect of the present invention, the slider member 160 is provided with a locking mechanism which provides a means for selectively restricting movement of the slider 160 with respect to the interlocking fastening strips 106. As will be described in greater detail below, several different embodiments of the inventive locking mechanism are illustrated herein at FIGS. 3-18. In each embodiment, the locking mechanism is adjustably disposed on the slider member 160 for incremental interaction with the interlocking fastening strips 106. More specifically, each locking mechanism is movable between a deactivated position – as shown, for example, in FIGS. 3, 5, 7, 9, 11, 13, 15 and 17 – and an activated position – as shown, for example, in FIGS. 4, 6, 8, 10, 12, 14, 16 and 18. In the deactivated position, each locking mechanism is disposed to freely move along the interlocking fastening strips 106 in a substantially non-interfering manner which allows the slider member 160 to travel along the fastening strips 106 without appreciable hindrance. In the activated position, however, each locking mechanism is disposed to engage at least one of the interlocking fastening strips by digging into or otherwise gripping at least one of the interlocking fastening strips 106. Thus, when the inventive locking mechanism is in the activated position, the slider member 160 is not only restricted from moving with respect to the fastening strips 106, but is also prevented from traveling off of the ends 107 and 108 of the interlocking fastening strips 106 without the use of end stops, clips, clamps, or other structures affixed to the ends thereof. Each embodiment of the inventive

locking mechanism will now be discussed in turn.

As shown in FIGS. 3 and 4, the first embodiment of the locking mechanism 200 comprises a pair of eccentrically-shaped locking members 210 arranged on either side of the slider member 160 and pivotably disposed within opposed cavities 173 formed in the top portion 172 of the housing 170. In the illustrated embodiment, each locking member 210 includes an outboard portion 211, an inboard portion 213, and a pair of operating surfaces which interact with either one or both of the outward surfaces 122 of the interlocking fastening strips 106. In particular, each locking member 210 includes a generally flat first operating surface 212 which underlies the outboard portion 211, and a curved and eccentric second operating surface 214 which underlies the inboard portion 213. The inboard portion 213 of each locking member 210 is pivotably attached to the side portions 174 of the housing 170 by a pivot pin 216 or the like.

In operation, the first embodiment of the inventive locking mechanism 200 conveniently restricts movement of the slider member 160 at the first and second ends 107, 108 of the interlocking fastening strips 106. For instance, when the slider member 160 is disposed between the first and second ends 107, 108 of the interlocking fastening strips 106, the locking mechanism 200 automatically assumes the deactivated position, as shown, for example, in FIG. 3. In the deactivated position, the first and second operating surfaces 212 and 214 of each locking member 210 freely engage or ride along one or both of the outward surfaces 122 of the interlocking fastening strips 106 in a substantially non-interfering manner.

Upon moving the slider member 160 to either the first or second end 107, 108 of the fastening strips 106, however, the first operating surface 212 of the appropriate locking member 210 ultimately loses contact with or disengages the fastening strip 106 which allows that locking member 210 of the locking mechanism 200 to rotate into the activated position by force of friction, as shown, for example, in FIG. 4. More specifically, once the first operating surface 212 disengages the fastening strip 106, continued motion of the slider member 160 in the left to right or deocclusion direction 162 allows the frictional contact between the curved second operating surface 214 of the locking member 210 and the outward surface 122 of the interlocking fastening strips 106 to rotate the locking member 210 about pin 216, in a clockwise or locking direction indicated by reference numeral 244, and into the activated position. In the activated position, the curved second operating surface 214 of the applicable locking member 210 compressibly engages or digs into one or both of the outward surfaces 122 of the interlocking fastening strips 106 which retains the slider member 160 at that end 108 (or 107) of the fastening strips 106.

In keeping with an important aspect of the present invention, the rotation of the applicable locking member 210 into the activated position is facilitated by the eccentric relationship between the second operating surface 214 and pin 216. The second operating surface 214 may have a cam shape. In particular, after the first operating surface 212 of the applicable locking member 210 has disengaged the interlocking fastening strips 106, the degree of frictional contact between the second operating surface 214 and the fastening strips 110 progressively increases as the slider member 160 continues to move in

direction 165 due to this eccentric relationship. This eccentric relationship and increased frictional contact also causes the second operating surface 214 to rotate into the activated position and to compressibly engage the fastening strips 106, as shown in FIG. 4. In this way, the first embodiment of the inventive locking mechanism 200 reliably prevents the slider member 160 from traveling off of the ends 107, 108 of the interlocking fastening strips 106 without the use of end stops, clips, clamps, or other structures affixed to the ends thereof.

Referring to FIG. 4, when the slider 160 is moved in the right to left or occlusion direction 161 away from the end 108 the frictional contact between the curved second operating surface 214 of the locking member and the outward surface 122 of the fastening strip rotates the locking member 210 about the pin 216 in the counter clockwise or unlocking direction 245. The locking member 210 rotates until the locking member is in the deactivated position as shown in FIG. 3.

Although this embodiment and other embodiments herein show two locking members, one locking member may be used as desired and appropriate. In addition, the locking member(s) may be used in conjunction with an end stop. For example, one embodiment may include one locking member which engages a first end of the fastening strips and may include an end stop at a second end of the fastening strips. In another embodiment, the slider may have one or two locking members and the fastening strips may have a first end stop at a first end of the fastening strips and a second end stop at a second end of the fastening strips. In another embodiment, the slider may interact with the end stop(s). For example, the locking member may engage a portion of the end stop and interact with the end stop to

hold the locking member. In another example, another portion of the slider may engage and interact with a portion of the end stop.

As shown in FIGS. 5 and 6, the second embodiment of the locking mechanism 300 is similar to the first embodiment of the locking mechanism 200 shown in FIGS. 3 and 4, except that one of the eccentrically-shaped locking members 320 includes an upper section for manual activation. More specifically, the larger locking member 320 includes an upper section 323 which protrudes through the top portion 372 of the housing 370 and enables a user to conveniently restrict movement of the slider member 360 at any position along the interlocking fastening strips 306, including the first and second ends 307, 308 thereof. In order to accommodate the larger locking member 320, the associated cavity 373 of the housing 370 is not only deeper, but open along the top portion 372 of the housing 370. As with the first embodiment, both the small locking member 310 and the large locking member 320 include an outboard portion 311 with a generally flat, first operating surface 312, an inboard portion 313 with a curved and eccentric second operating surface 314, and a pin 316 or the like for pivotably attaching the inboard portion 313 to the side portions 374 of the housing 370.

In use, the second embodiment of the locking mechanism 300 may be used to conveniently restrict movement of the slider member 360 at any desired position along the interlocking fastening strips 306, including the first and second ends 307, 308 thereof. For example, by manually rotating the upper section 323 of the larger locking member 320 inwardly toward the housing 370 in the clockwise direction 333 as shown in FIG. 6, the locking mechanism 300 may be conveniently moved from the

deactivated position shown in FIG. 5 to the activated position shown in FIG. 6. In the activated position, the curved second operating surface 314 of the larger locking member 320 compressibly engages or digs into one or both of the outward surfaces 322 of the interlocking fastening strips 306 which causes the slider member 360 to be reliably retained in place on the fastening strips 306. When the user wishes to move the slider member 360 which is held by the locking member 320, the user rotates the locking member 320 in the counter clockwise direction 334 as shown in FIG. 6. As the locking member 320 returns to the deactivated position shown in FIG. 5, the user is able to move the slider member 360 along the fastening strip 306.

In addition, and as described in greater detail above in connection with the first embodiment of the locking mechanism 200, the second embodiment of the locking mechanism 300 may also be used to restrict movement of the slider member 360 at the first or second end 111 or 112 of the interlocking fastening strips 306. In particular, the locking members 310 and 320 may be moved into the activated position by moving the slider member 360 towards the first or second end 307, 308 of the interlocking fastening strips 310. The first flat operating surface 312 of the appropriate locking member 310 or 320 disengages or loses contact with the outward surface 322 of the fastening strips 306 and the curved second operating surface 314 compressibly engages or digs into the interlocking fastening strips 306 due to continuing frictional contact between the curved second operating surface 314 and the fastening strips 310. As in the first embodiment, the rotation of the applicable locking member 310 or 320 into the activated position is facilitated by the eccentric relationship between the second operating

surface 314 and pin 316.

As described herein for the first embodiment, when the slider 360 is moved away from the end 307, 308, the frictional contact between the curved second operating surface 314 of the locking member and the outward surface 322 of the fastening strip rotates the locking member 310, 320 about the pin 316. The locking member 310, 320 rotates until the locking member is in the deactivated position as shown in FIG. 5.

Thus, the locking mechanism 300 may be used to conveniently restrict movement of the slider member 360 at any desired position along the interlocking fastening strips 306, including the first and second ends 307, 308 thereof, without the use of end stops, clips, clamps, or other structures affixed to the ends 307, 308 of the fastening strips 306. This feature of restricting movement at any desired position may be used as appropriate with any of the embodiments described herein.

As shown in FIGS. 7 and 8, the third embodiment of the closure device includes an uneven surface on the fastening strip(s) and an engaging surface on the locking mechanism to enhance interaction between the two surfaces. Specifically, the locking mechanism 400 comprises a pair of irregularly-shaped locking members 410 pivotably disposed within opposed cavities 473 formed in the top portion 472 of the housing 470. As in the previous embodiments, the third embodiment of the locking mechanism 400 allows a user to conveniently restrict movement of the slider member 460 at the first and second ends 407, 408 of the interlocking fastening strips 406.

As shown in FIGS. 7 and 8, each locking member 410

includes an outboard portion 411 with a first operating surface 412, an inboard portion 413 with a second operating surface 414, and a pin 416 for pivotably attaching the inboard portion 413 between the side portions of housing 470. In the illustrated embodiment, the first operating surface 412 is generally flat, underlies the outboard portion 411, and selectively engages an uneven surface 424 formed in the outward surface 422 of at least one of the interlocking fastening strips 406. The second operating surface 414 is curved and eccentrically disposed with respect to pin 416, underlies the inboard portion 413, and includes an engaging surface 415 which at least partially engage the uneven surface 424 of the interlocking fastening strips 406.

In one embodiment, the uneven surface 424 of the interlocking fastening strips 406 is in the form of a rack with substantially uniform gear teeth, and the engaging surface 415 of the second operating surface 414 is in the form of ridges or complementary gear teeth. Although the uneven surface 424 of the interlocking fastening strips 406 and the engaging surface 415 of the second operating surface 414 have been described and illustrated herein as gear teeth, it will be readily appreciated by those skilled in the art that other types of uneven surfaces 424 and engaging surfaces 415 may alternatively be used without departing from the scope or spirit of the present invention.

In operation, the third embodiment of the locking mechanism 400 conveniently restricts the slider member 460 from moving with respect to the first and second ends 407, 408 of the interlocking fastening strips 406. For instance, when the slider member 460 is disposed between

the first and second ends 407, 408 of the fastening strips 406, the third embodiment of the locking mechanism 400 assumes the deactivated position, as shown, for example, in FIG. 7. In the deactivated position, the first operating surface 412 of each locking member 410 and the engaging surface 415 of the second operating surface 414 freely engage or ride along the uneven, surface 424 of the interlocking fastening strips 406 in a substantially non-interfering manner.

When the slider member 460 is moved to either end 407, 408 of the interlocking fastening strips 406, the first flat operating surface 412 of the appropriate locking member 410 loses contact with or disengages the interlocking fastening strips 406, and the engaging surface 415 of the second operating surface 412 restrictively engage or mesh with the uneven surface 424 of the interlocking fastening strips 406. For example, when the slider member is moved in the deocclusion direction 462, the locking member 410 rotates in the clockwise or locking direction 444 and achieves the activated position as shown in FIG. 8. The curved second operating surface 414 compressibly engages or digs into the interlocking fastening strips and retains the slider member 460 at that end 408 (or 407) of the fastening strips 406. As noted above, the rotation of the locking member 410 into the activated position is facilitated by the eccentric relationship between the second operating surface 414 and the pin 416. Thus, the locking mechanism 400 conveniently prevents the slider member 460 from being removed from or traveling off of the ends 407, 408 of the interlocking fastening strips 406 without the use of end stops, clips, clamps, or other external structures disposed at the ends 407, 408 thereof.

Referring to FIG. 8 when the slider 460 is moved in the occlusion direction 461 away from the end 408, the engaging contact between the engaging surface 415 of the second operating surface and the uneven surface 424 of the fastening strip rotates the locking member 410 about the pin 416 in the counter clockwise or unlocking direction 445. The locking member 410 rotates until the locking member is in the deactivated position as shown in FIG. 7.

In keeping with another aspect of the present invention, interaction between the engaging surface 415 of the second operating surface 412 and the uneven, surface 424 of the interlocking fastening strips 406 provides a feel of ratcheting engagement, as well as an audible sound, when the slider member 460 is moved along the interlocking fastening strips 406. In this way, the third embodiment of the locking mechanism 400 advantageously provides a tactile and/or audible indication of the movement or travel of the slider 460.

This feature of the uneven surface and the engaging surface may be used as appropriate with any of the embodiments described herein.

As shown in FIGS. 9 and 10, the fourth embodiment of the locking mechanism 500 is similar to the third embodiment shown in FIGS. 8 and 9, except that both of the irregularly-shaped locking members 510 include a fin element 528 which provides a tactile and/or audible indication of travel when the slider member 560 is moved along the interlocking fastening strips 506. As in the third embodiment, each locking member 510 of the fourth embodiment includes an outboard portion 511 with a first operating surface 512, an inboard portion 513 with a second operating surface 514, and a pin 516 for pivotably

attaching the inboard portion 513 between the side portions of housing 570. More specifically, the first operating surface 512 is generally flat, underlies the outboard portion 511, and selectively engages the uneven surface 524 formed in the outward surface 522 of at least one of the interlocking fastening strips 506. The second operating surface 514 is curved and eccentrically disposed with respect to pin 516, underlies the inboard portion 513, and includes an engaging surface 515, such as, a plurality of gear-like ridges which at least partially engage the uneven surface 524 of the fastening strips 506.

In use, the fourth embodiment of the locking mechanism 500 operates in a similar manner to the third embodiment shown in FIGS. 7 and 8, except that the two fin elements 528 interact with the uneven surface 524 of the interlocking fastening strips 506 to produce a tactile and/or audible indication of slider 560 travel. In particular, when the slider member 560 is moved along the interlocking fastening strips 506, the two fin elements 528 provide a tactile and/or audible indication of slider travel by successively engaging with the uneven surface 524 of the interlocking fastening strips 506 and by vibrating against the outboard portion 511 of each locking member 510.

As shown in FIGS. 11 and 12, the fifth embodiment of the locking mechanism 600 is comparable to the third embodiment shown in FIGS. 8 and 9, except that the irregularly-shaped locking members 610 selectively engage an uneven surface 627 formed in one of the external side portions 626 of the interlocking fastening strips 630, 640 instead of the uneven surface 424 formed in the outward surface 422 of the fastening strips 406. For this reason, each locking member 610 of the fifth embodiment is

pivotably disposed within a cavity 677 formed in one of the side portions 674 of the slider housing 670. Like previous embodiments, each locking member 610 includes an outboard portion 611 with a first operating surface 612, an inboard portion 613 with a second operating surface 614, and a pin 616 for pivotably attaching the inboard portion 613 to the housing 670. More specifically, the first operating surface 612 is generally flat, underlies the outboard portion 611, and selectively engages the uneven surface 627 formed in the one of the external side portions 626 of the interlocking fastening strips 630, 640. The second operating surface 614, conversely, is curved and eccentrically disposed with respect to pin 616, underlies the inboard portion 613, and includes an engaging surface 615, such as, a plurality of gear-like ridges, which at least partially engages the uneven surface 627 of the interlocking fastening strip 640.

In operation, the fifth embodiment of the locking mechanism 600 restricts movement of the slider member 660 with respect to the first and second ends 607, 608 of the interlocking fastening strips 630, 640. Indeed, the fifth embodiment of the locking mechanism 600 functions in a similar manner as the third embodiment shown in FIGS. 7 and 8, except that it engages a different edge of the fastening strips 630, 640. In particular, when the slider member 660 is disposed between the first and second ends 608, 607 of the interlocking fastening strips 630, 640, the fifth embodiment of the locking mechanism 600 assumes the deactivated position shown in FIG. 11. In the deactivated position, the first operating surface 612 of each locking member 610 and the engaging surface 615 of the second operating surface 614 freely engage or ride along the uneven surface 627 formed along the external side portion 626 of the interlocking fastening strip 640

in a substantially non-interfering manner.

When the slider member 660 is moved in the left to right or deocclusion direction 662 to end 608 of the interlocking fastening strips 630, 640, the first operating surface 612 of the appropriate locking member 610 loses contact with or disengages the interlocking fastening strip 640. The engaging surface 615 of the second operating surface 612 restrictively engages or meshes with the uneven surface 627 of the interlocking fastening strips 640 and rotates the locking member 610 in the clockwise or locking direction 644. The locking member 610 achieves the activated position a shown in FIG. 12 to retain the slider member 660 at that end 608 of the fastening strips 630, 640.

Referring to FIG. 12, when the slider member 660 is moved in the right to left or occlusion direction 661 away from the end 608, the contact between the second operating surface 214 of the locking member and the outward surface 626 of the fastening strip rotates the locking member 610 about the pin 616 in the counter clockwise or unlocking direction 645. The locking member 610 rotates until the locking member is in the deactivated position as shown in FIG. 11.

A corresponding action may occur at the other end 607 when the slider member 660 is moved to or away from that end 607.

This feature of the locking mechanism engaging the side of the fastening strip may be used as appropriate with any of the embodiments herein. As an example of another embodiment, a first locking mechanism may engage the first side 626 and a second locking mechanism may

engage the second side 628. In yet another embodiment, a first locking mechanism may engage one or both of the sides 626, 628 and a second locking mechanism may engage the upper surface 622.

As shown in FIGS. 13 and 14, the sixth embodiment of the locking mechanism 700 comprises a rocker element or locking member 710 pivotably disposed within a lengthwise cavity 773 formed along the top portion 772 of housing 770. More specifically, the rocker element or locking member 710 includes a pair of outboard end portions 711 which project outwardly from either end of the slider member 760. The rocker element or locking member 710 also includes an inboard body portion 713 which is pivotably attached between the opposed side portions of the housing 770 by pin 716. In particular, the locking member 710 includes a first operating surface 712 which underlies the outboard portion 711, and a curved, eccentric operating surface 714 which underlies the inboard portion 713. In order to prevent-over rotation of the rocker element 710 with respect to the slider member 760 and the interlocking fastening strips 706, the cavity 773 of the housing 770 may be provided with a generally arcuate stop surface 775 which is adapted to selectively engage the inboard body portion 713 of the rocker element 710.

In operation, the sixth embodiment of the locking mechanism 700 restricts movement of the slider member 760 at the first and second ends 707, 708 of the interlocking fastening strips 706. By way of example, when the slider member 760 is disposed between the first and second ends 707, 708 of the interlocking fastening strips 706, the sixth embodiment of locking mechanism 700 assumes the

deactivated position, as shown in FIG. 13. In the deactivated position, the first operating surfaces 712 of the outboard end portions and the second operating surface 714 of the inboard body portion freely engage or ride along one or both of the outward surfaces 722 of the interlocking fastening strips 706 in a substantially non-interfering manner.

Upon moving the slider member 760 to either the first or second end 707, 708 of the fastening strips 706, the first operating surface 712 loses contact or disengages the fastening strips 706 which allows the locking mechanism 700 to be rotated into the activated position, as shown in FIG. 14, by force of friction. For example, once the first operating surface 712 disengages the fastening strip 706, continued motion of the slider member 760 in the left to right or deocclusion direction 762 allows the frictional contact between the curved second operating surface 714 of the cam and the outward surface 722 of the fastening strip to rotate the locking member 710. The locking member 710 rotates about the pin 716 in a clockwise or locking direction 744 and into the activated position. In the activated position, the curved second operating surface 714 of the locking member 710 compressibly engages or digs into one or both of the outward surfaces 722 of the interlocking fastening strips 706 which retains the slider member 760 at that end 708 of the fastening strips. In this way, the sixth embodiment of the locking mechanism 700 conveniently retains the slider member 760 at the first and second ends 707 and 708 of the interlocking fastening strips 706 and prevents the slider member 760 from traveling off of the ends 707 and 708 of the fastening strips without the use of end stops, clips, clamps, or other structures affixed to the ends thereof.

As noted herein, the rotation of the locking member 710 into the activated position is facilitated by the eccentric relationship between the second operating surface 714 and the pin 716.

Referring to FIG. 14, when the slider member 760 is moved in the right to left or occlusion direction 761 away from the end 708, the frictional contact between the second operating surface 714 of the locking member and the outward surface 722 of the fastening strip rotates the locking member 710 about the pin 716 in the counter clockwise or unlocking direction 745. The locking member 710 rotates until the locking member is in the deactivated position as shown in FIG. 13.

As shown in FIGS. 15 and 16, the seventh embodiment of the locking mechanism 800 is similar to the embodiment shown in FIGS. 13 and 14 except the locking mechanism uses integral or unitary resilient arms or portions which are pivoted or biased upwardly in the deactivated position. Specifically, the locking mechanism 800 comprises a pair of locking members 810 pivotably disposed within a lengthwise cavity 873 formed along the top portion 872 of housing 870. Each locking member 810 includes an outboard end portion 811 which projects outwardly from the end of the slider member 860. Each locking member 810 also includes an inboard body portion 813 which is pivotably attached to at least one of the opposed side portions of the housing 870 by center portion 816. The inboard body portions 813 are integral or unitary with the center portion 816.

The portions 813 are pivoted or biased upwardly in the deactivated position as shown in FIG. 15. When the slider 860 is not positioned on the fastening strips 806,

the resilient portions 813 have a relaxed position 874 as shown by the dashed lines in FIG. 15. Thus, the resilient portions 813 are biased upwardly as shown by the solid lines in FIG. 15 due to the resilience of the portions 813 and the engagement with the fastening strips 806. The resilient portions 813 exert a downward force on the fastening strips due to the biasing or deflection energy of the portions 813 in an attempt to return to the relaxed position 874. In the activated position as shown in FIG. 16, the portion 813 is pivoted or biased downwardly due to the biasing energy. The activated position is between the deactivated position and the relaxed position. In the activated position, the portion 813 exerts a force on the fastening strips.

The locking member 810 includes a first operating surface 812 which underlies the outboard portion 811, and a curved, eccentric second operating surface 814 which underlies the inboard portion 813. The second operating surface 814 and/or the fastening strip 806 may include an uneven surface or engaging surface. For example, the uneven surfaces and/or engaging surfaces discussed with respect to FIGS. 7 and 8 may be used.

In operation, the seventh embodiment of the locking mechanism 800 restricts movement of the slider member 860 at the first and second ends 807, 808 of the interlocking fastening strips 806. By way of example, when the slider member 860 is disposed between the first and second ends 807, 808 of the interlocking fastening strips 806, the seventh embodiment of locking mechanism 800 assumes the deactivated position, a shown in FIG. 15. In the deactivated position, the first operating surfaces 812 of the outboard end portions and the second operating surface 814 of the inboard body portion freely engage or ride

along one or both of the outward surfaces 822 of the interlocking fastening strips 806 in a substantially non-interfering manner.

Upon moving the slider member 860 to either the first or second end 807, 808 of the fastening strips 806, the first operating surface 812 loses contact or disengages the fastening strips 806 which allows the locking mechanism 800 to be rotated or biased downward into the activated position, as shown in FIG. 16 due to the biasing energy. In addition, once the first operating surface 812 disengages the fastening strip 806, continued motion of the slider member 860 in the left to right or deocclusion direction 862 allows the frictional contact between the curved second operating surface 814 of the cam and the outward surface 822 of the fastening strip to rotate the locking member 810. The locking member 810 rotates or biases about the center portion 816 in a clockwise or locking direction 844 and into the activated position. In the activated position, the curved second operating surface 814 of the locking member 810 compressibly engages or digs into one or both of the outward surfaces 822 of the interlocking fastening strips 806 which retains the slider member 860 at that end 808 of the fastening strips. In this way, the seventh embodiment of the locking mechanism 800 conveniently retains the slider member 860 at the first and second ends 807 and 808 of the interlocking fastening strips 806 and prevents the slider member 860 from traveling off of the ends 807 and 808 of the fastening strips without the use of end stops, clips, clamps, or other structures affixed to the ends thereof.

As noted herein, the rotation of the locking member 810 into the activated position is facilitated by the eccentric relationship between the second operating

surface 814 and the center portion 816.

Referring to FIG. 16, when the slider member 860 is moved in the right to left or occlusion direction 861 away from the end 808, the contact between the operating surfaces 812, 814 of the locking member and the outward surface 822 of the fastening strip rotates or biases the locking member 810 about the center portion 816 in the counter clockwise or unlocking direction 845. The locking member 810 rotates or biases upwardly until the locking member is in the deactivated position as shown in FIG. 15.

As shown in FIGS. 17 and 18, the eighth embodiment of the locking mechanism 900 comprises a pair of resilient locking members 910 which are adapted to restrict movement of the slider member 960 at the first and second ends 907, 908 of the interlocking fastening strips 906. As with some previous embodiments, each resilient locking member 910 is pivotably disposed within opposed cavities 973 formed in the top portion 972 of the slider housing 970. In addition, each resilient locking member 910 includes an inboard body portion 913 which is pivotably attached between the opposed side portions of the housing 970 by pin 916 and an arm portion 911 which projects outwardly away from the body portion 913. The arm portion 911 may include a block portion 918 which is disposed at the distal end of arm portion 911. The arm portion 911 may include a first operating surface 912.

As with some previous embodiments, each resilient locking member 910 includes a curved second operating surface 914 which underlies the inboard body portion 913 and which is eccentrically disposed with respect to pin 916. In addition, the arm portion 911 of each resilient locking member 910 selectively flexibly engages or biases

against an obstruction element 985. In the illustrated embodiment, the obstruction element 985 is in the form of a rod extending transversely across each cavity 973 between the opposed side portions of housing 970. More specifically, the arm portion 911 of the appropriate resilient locking member 910 engages obstruction element 985 when the slider member 960 is between the two ends 907, 908 of the interlocking fastening strips 906.

In use, the eighth embodiment of the locking mechanism 900 restricts movement of the slider member 960 at the first and second ends 907, 908 of the interlocking fastening strips 906. For example, when the slider member 960 is disposed between the first and second ends 907, 908 of the fastening strips 906, the seventh embodiment of locking mechanism 900 assumes the deactivated position, as shown in FIG. 17. In the deactivated position, the arm portion 911 of each resilient locking member 910 is bent against the rod 985 of the housing 970 while the first operating surface 912 and the second operating surface 914 of the inboard body portion 913 freely engage or ride along one or both of the outward surfaces 922 of the fastening strips 906 in a substantially non-interfering manner.

Upon moving the slider member 960 to either the first end 907 or the second end 908 of the interlocking fastening strips 906, the first operating surface 912 of the appropriate resilient locking member 910 disengages the fastening strips 906 which allows the locking mechanism 900 to assume the activated position, as shown in FIG. 18. Specifically, when the slider member 960 is moved in the left to right or deocclusion direction 962, the resilient locking member 910 disengages the rod 985 of the housing 970 which causes the arm portion 911 to

straighten out. Furthermore, the body portion 913 rotates in the clockwise or locking direction 944 which causes the second operating surface 914 to compressibly engage or dig into one or both of the outward surfaces 922 of the fastening strips 906. This action also causes the arm portion 911 to engage the appropriate end 908 (or 907) of the fastening strips 906. Thus, the eighth embodiment of the locking mechanism 900 advantageously retains the slider member 960 at both the first and second ends 907, 908 of the interlocking fastening strips 906 and also prevents the slider member 960 from traveling off of the ends 907 and 908 of the fastening strips 906 without the use of end stops, clips, clamps, or other structures disposed at the ends thereof.

As noted herein, the rotation of the locking member 910 into the activated position is facilitated by the eccentric relationship between the second operating surface 914 and the pin 916.

Referring to FIG. 18, when the slider member 960 is moved in the right to left or occlusion direction 961 away from the end 908, the frictional contact between the second operating surface 914 of the locking member and the outward surface 922 of the fastening strip rotates the locking member 910 about the pin 916 in the counter clockwise or unlocking direction 945. The locking member 910 rotates until the locking member is in the deactivated position as shown in FIG. 17.

While several different embodiments of the locking mechanism have been specifically described and illustrated herein, it will be readily appreciated by those skilled in the art that these particular embodiments are provided for illustrative purposes only and do not represent an

exhaustive register of locking mechanisms covered by the present invention. Indeed, other types of locking mechanisms may alternatively be provided for restricting movement of the slider member with respect to the interlocking fastening strips without departing from the scope or spirit of the present invention.

As mentioned briefly above, the interlocking fastening strips of the present invention may be of virtually any type or form. For example, the interlocking fastening strips may comprise shear action or Z-axis closure strips 1010, as shown in FIG. 19. Shear action closure strips include a first fastening strip 1031 and a second fastening strip 1041 which engage upon moving the slider member 1060 in the occlusion direction. With shear action closure elements, the inventive locking mechanism 1000 may engage the upper surface 1022 of the first fastening strip 1031, as shown, for example, in FIG. 19.

The interlocking fastening strips may optionally comprise U-channel closure strips as shown in FIG. 20. U-channel closure strips 1110 preferably include a first fastening strip 1132 with hook portions 1133, and an associated second fastening strip 1142 with inner hook portions 1143 and outer wings 1144. With U-channel type closure elements, the inventive locking mechanism 1100 may engage the upper surface 1022 of one of the outer wings 1144, as shown in FIG. 20. If the fastening strip does not include wings 1144, then the locking mechanism 1000 engages the upper surface 1123.

In addition, the interlocking fastening strips may alternatively comprise arrowhead-type closure strips 1210, as shown in FIG. 21. As described more fully in U.S. Patents 5,007,142 and 5,020,194, arrowhead-type closure

strips typically include a first fastening strip 1246 with an arrowhead-shaped engagement portion 1247, and an associated second fastening strip 1236 with a cup-shaped engagement portion 1237. In use, the first fastening strip 1246 and the second fastening strip 1236 and are selectively coupled and decoupled by moving the slider member in the appropriate direction. This coupling/decoupling action is usually accomplished by a separator finger 182 (only a portion of which is shown) which projects downwardly from the top portion 172 of the slider member between the first fastening strip 1246 and the second fastening strip 1236. With arrowhead-type closure elements, the inventive locking mechanism 1200 may engage the upper surface 1222 of each fastening strip 1246 and 1236, as shown, for example, in FIG. 21.

As shown in FIG. 22, the interlocking fastening strips may optionally comprise rolling action closure strips 1310, as shown, for example, in FIG. 22. As described in greater detail in U.S. Patent No. 5,007,143, rolling action closure strips include interlocking profile elements 1348 and 1338. With such rolling action closure elements, the inventive locking mechanism 1300 may engage the upper surface 1322 of each element 1348 and 1338, as shown, for example, in FIG. 22 or may engage the side surface 1326.

Although several interlocking fastening strip embodiments have been specifically described and illustrated herein, it will be readily appreciated by those skilled in the art that other kinds, types, or forms of fastening strips may alternatively be used without departing from the scope or spirit of the present invention.

The interlocking fastening strips of the present invention may be manufactured by extrusion through a die that has the approximate dimensions given above, although the die should be made somewhat larger than the desired final dimensions of the fastening strips, inasmuch as shrinkage of the extruded fastening strips is likely upon cooling. In addition, the fastening strips should be manufactured to have approximately uniform cross-sections. This not only simplifies the manufacturing of a closure device, but also contributes to the physical flexibility of the closure device, which may be a desirable property.

Generally, the interlocking fastening strips of the present invention may be formed from any suitable thermoplastic material including, for example, polyethylene, polypropylene, nylon, or the like, or from a combination thereof. Thus, resins or mixtures of resins such as high density polyethylene, medium density polyethylene, and low density polyethylene may be employed to prepare the interlocking fastening strips of the present invention. In most instances, the fastening strips are preferably made from low density polyethylene. The selection of the appropriate thermoplastic material, however, is related to the particular design of the fastening strips, the Young's Modulus of the thermoplastic material, and the desired elasticity and flexibility of the strips.

When the fastening strips of the present invention are used in a sealable bag, the fastening strips and the films that form the body of the bag may be conveniently manufactured from heat sealable material. In this way, the bag may be economically formed by using an aforementioned thermoplastic material and by heat sealing the fastening strips to the bag. In most instances, the

bag is preferably made from a mixture of high pressure, low density polyethylene and linear, low density polyethylene.

The fastening strips of the present invention may be manufactured by extrusion or other known methods. For example, the closure device may be manufactured as individual fastening strips for later attachment to the bag or may be manufactured integrally with the bag. In addition, the fastening strips may be manufactured with or without flange portions on one or both of the fastening strips depending upon the intended use of the closure device or expected additional manufacturing operations.

Generally, the closure device of the present invention can be manufactured in a variety of forms to suit the intended use. In practicing the present invention, the closure device may be integrally formed on the opposing side walls of the container or bag, or connected to the container by the use of any of many known methods. For example, a thermoelectric device may be applied to a film in contact with the flange portion of the fastening strips or the thermoelectric device may be applied to a film in contact with the base portion of fastening strips having no flange portion, to cause a transfer of heat through the film to produce melting at the interface of the film and a flange portion or base portion of the fastening strips. Suitable thermoelectric devices include heated rotary discs, traveling heater bands, resistance-heated slide wires, and the like. The connection between the film and the fastening strips may also be established by the use of hot melt adhesives, hot jets of air to the interface, ultrasonic heating, or other known methods. The bonding of the fastening strips to the film stock may be carried out either before or after the

film is U-folded to form the bag. In any event, such bonding is done prior to side sealing the bag at the edges by conventional thermal cutting. In addition, the first and second fastening strips may be positioned on opposite sides of the film. Such an embodiment would be suited for wrapping an object or a collection of objects such as wires. The first and second fastening strips should usually be positioned on the film in a generally parallel relationship with respect to each other, although this will depend on the intended use.

The slider may be multiple parts and snapped together. In addition, the slider may be made from multiple parts and fused or welded together. The slider may also be a one piece construction. The slider can be colored, opaque or clear. The slider may be injection molded or made by any other method. The slider may be molded from any suitable plastic material, such as, nylon, polypropylene, polystyrene, acetal, toughened acetal, polyketone, polybutylene terrephthalate, high density polyethylene, polycarbonate or ABS (acrylonitrile-butadiene-styrene).

In summary, the present invention provides a closure device that overcomes many of the drawbacks inherent in the prior art. More specifically, the present invention affords a closure device with interlocking fastening strips, a slider member which facilitates the occlusion and deoclusion of the fastening strips, and a locking mechanism which provides a means for selectively restricting movement of the slider member with respect to the fastening strips without the use of stops, clips, clamps, or similar structures affixed to the ends of the fastening strips.

From the foregoing it will be understood that modifications and variations may be effectuated to the disclosed structures – particularly in light of the foregoing teachings – without departing from the scope or spirit of the present invention. As such, no limitation with respect to the specific embodiments described and illustrated herein is intended or should be inferred. Indeed, the following claims are intended to cover all modifications and variations that fall within the scope and spirit of the present invention. In addition, all references and copending applications cited herein are hereby incorporated by reference in their entireties.

WHAT IS CLAIMED IS:

1. A closure device comprising:

a first fastening strip;

a second fastening strip; and

a slider member slidably disposed on the fastening strips, the slider member facilitating the occlusion of said fastening strips when moved towards a first end thereof and facilitating the deocclusion of said fastening strips when moved towards a second end thereof, the slider member having a locking mechanism, the locking mechanism being movable between a deactivated position wherein the locking mechanism is disposed to move along said fastening strips and an activated position wherein the locking mechanism is disposed to engage one of said fastening strips and to restrict movement of the slider member with respect to said fastening strip.

2. The invention as in claim 1, wherein the slider member comprises a housing having a top portion, side portions, and an internal void between the side portions for receiving the fastening strips.

3. The invention as in claim 2, wherein the locking mechanism is disposed in the top portion of the housing and is adapted to engage an outward surface of said fastening strip.

4. The invention as in claim 2, wherein the locking mechanism is disposed in one of the side portions of the housing and is adapted to engage an external side portion of said fastening strip.

5. The invention as in claim 1 wherein the locking mechanism is automatically movable between the deactivated position and the activated position.

6. The invention as in claim 1, wherein the locking mechanism is manually movable between the deactivated position and the activated position.

7. The invention as in claim 1 wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of said fastening strip.

8. The invention as in claim 1 wherein the locking mechanism is movable into the activated position when the slider member is between the ends of said fastening strip.

9. The invention as in claim 1, wherein the locking mechanism includes a locking member.

10. The invention as in claim 9 wherein said locking member is pivotably attached to the slider member.

11. The invention as in claim 9 wherein said locking member having first and second operating surfaces.

12. The invention as in claim 11, wherein the first operating surface of said locking member freely engages said fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated

position and the slider member is between the first and second ends of said fastening strip, and disengages said fastening strip when the slider member is at the first and second ends thereof.

13. The invention as in claim 11, wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of said fastening strip.

14. The invention as in claim 13, wherein the second operating surface of said locking member is adapted to compressibly engage said fastening strip when the locking mechanism is in the activated position so as to retain the slider member at one of the ends of said fastening strip.

15. The invention as in claim 11, wherein the locking mechanism is movable into the activated position when the slider member is between the ends of said fastening strip.

16. The invention as in claim 15, wherein the second operating surface is adapted to compressibly engage the fastening strip when the locking mechanism is in the activated position so as to retain the slider member in place on said fastening strip.

17. The invention as in claim 11, wherein the second operating surface is curved in configuration.

18. The invention as in claim 17 wherein said

second operating surface is eccentric with respect to the pivot point.

19. The invention as in claim 18 wherein said second operating surface has a cam shape.

20. The invention as in claim 1, wherein said fastening strip includes an uneven surface, and the locking mechanism comprises a locking member having a second operating surface, the second operating surface having an engaging surface formed thereon.

21. The invention as in claim 20, wherein the uneven surface includes a rack with substantially uniform gear teeth.

22. The invention as set forth in claim 20, wherein the engaging surface includes gear teeth.

23. The invention as in claim 20, wherein the uneven surface is disposed on an upper surface of at least one of the fastening strips.

24. The invention as in claim 20, wherein the uneven surface is disposed on a side portion of one of the fastening strips.

25. The invention as in claim 20, wherein the locking member has a first operating surface, said first operating surface and said engaging surface of the second operating surface freely engage said fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider

member is between the first and second ends of said fastening strips.

26. The invention as in claim 20, wherein said engaging surface of the second operating surface restrictively engages the uneven surface of said fastening strip when the locking mechanism is in the activated position and the slider member is at one of the ends of said fastening strips so as to retain the slider member at one of the ends of said fastening strips.

27. The invention as in claim 1, wherein at least one of the fastening strips includes an uneven surface and said locking mechanism includes an element which interacts with the uneven surface to produce an audible indication of travel as the slider member moves along said fastening strips.

28. The invention as in claim 1, wherein at least one of the fastening strips includes an uneven surface and said locking mechanism includes an element which interacts with the uneven surface to produce a tactile indication of travel as the slider member moves along said fastening strips.

29. The invention as in claim 1, wherein the locking mechanism comprises a locking member having a body portion, a first end portion and a second end portion, the body portion being pivotably attached to the slider member.

30. The invention as in claim 29, wherein the end portions freely engage said fastening strip in a

substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider member is between the first and second ends of said fastening strips.

31. The invention as in claim 29, wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of the fastening strips.

32. The invention as in claim 31, wherein the body portion of the locking member is adapted to compressibly engage said fastening strip when the slider member is in the activated position so as to retain the slider member at one of the ends of said fastening strips.

33. The invention as in claim 1, wherein the locking mechanism comprises a resilient locking member, said locking member including a body portion and an arm portion projecting outwardly therefrom, the body portion being pivotably attached to the slider member and including a second operating surface.

34. The invention as in claim 33, wherein the arm portion includes a block portion disposed at a distal end of the arm portion.

35. The invention as in claim 33, wherein the slider member includes an obstruction element, the arm portion selectively flexibly engages said obstruction element.

36. The invention as in claim 35, wherein the arm

portion flexibly engages the obstruction element and freely engages said fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider member is between the first and second ends of said fastening strips.

37. The invention as in claim 36, wherein the second operating surface of the body portion compressibly engages said fastening strip and the arm portion disengages the obstruction element when the locking mechanism is in the deactivated position and the slider member is at one of the ends of said fastening strips so as to retain the slider member at one of the ends of said fastening strips.

38. The invention as in claim 1, wherein the locking mechanism comprises a locking member having a body portion and a first end portion.

39. The invention as in claim 38 wherein a portion of said locking member pivots with respect to the slider member.

40. The invention as in claim 39 wherein said body portion is pivotally attached to the slider member.

41. The invention as in claim 39 wherein said body portion is unitary with said slider member.

42. The invention as in claim 41 wherein said first end portion and said body portion pivot with respect to the slider member.

43. The invention as in claim 42 wherein said first end portion and said body portion pivot by biasing with respect to said slider member.

44. The invention as in claim 43 wherein said locking member has a second end portion.

45. The invention as in claim 1, wherein the fastening strips comprise shear action fastening strips.

46. The invention as in claim 1, wherein the fastening strips comprise U-channel type fastening strips.

47. The invention as in claim 1, wherein the fastening strips comprise arrowhead-type fastening strips.

48. The invention as in claim 1, wherein the fastening strips comprise rolling action fastening strips.

49. A slider member adapted to facilitate the occlusion of fastening strips, the slider member comprising:

a housing adapted to be slidably disposed on fastening strips, the housing having a top portion, side portions, and an internal void between the side portions, the internal void being adapted to receive fastening strips; and

a locking mechanism adjustably disposed on the housing for movement between a deactivated position wherein the locking mechanism is adapted to move along the fastening strips and an activated position wherein the locking mechanism is adapted to engage a fastening strip and to restrict movement of the housing.

50. The invention as in claim 49, wherein the slider member comprises a housing having a top portion, side portions, and an internal void between the side portions for receiving a fastening strip.

51. The invention as in claim 50, wherein the locking mechanism is disposed in the top portion of the housing and is adapted to engage an outward surface of a fastening strip.

52. The invention as in claim 50, wherein the locking mechanism is disposed in one of the side portions of the housing and is adapted to engage an external side portion of a fastening strip.

53. The invention as in claim 49 wherein the locking mechanism is automatically movable between the deactivated position and the activated position.

54. The invention as in claim 49, wherein the locking mechanism is manually movable between the deactivated position and the activated position.

55. The invention as in claim 49 wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of a fastening strip.

56. The invention as in claim 49 wherein the locking mechanism is movable into the activated position when the slider member is between the ends of a fastening strip.

57. The invention as in claim 49, wherein the locking mechanism includes a locking member.

58. The invention as in claim 57 wherein said locking member is pivotably attached to the slider member.

59. The invention as in claim 57 wherein said locking member having first and second operating surfaces.

60. The invention as in claim 59, wherein the first operating surface of said locking member freely engages a fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider member is between the first and second ends of a fastening strip, and disengages a fastening strip when the slider member is at the first and second ends thereof.

61. The invention as in claim 59, wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of a fastening strip.

62. The invention as in claim 61, wherein the second operating surface of said locking member is adapted to compressibly engage a fastening strip when the locking mechanism is in the activated position so as to retain the slider member at one of the ends of a fastening strip.

63. The invention as in claim 59, wherein the locking mechanism is movable into the activated position when the slider member is between the ends of a fastening strip.

64. The invention as in claim 63, wherein the second operating surface is adapted to compressibly engage a fastening strip when the locking mechanism is in the activated position so as to retain the slider member in place on a fastening strip.

65. The invention as in claim 59, wherein the second operating surface is curved in configuration.

66. The invention as in claim 65 wherein said second operating surface is eccentric with respect to the pivot point.

67. The invention as in claim 66 wherein said second operating surface has a cam shape.

68. The invention as in claim 49, wherein a fastening strip includes an uneven surface, and the locking mechanism comprises a locking member having a second operating surface, the second operating surface having an engaging surface formed thereon.

69. The invention as in claim 68, wherein the uneven surface includes a rack with substantially uniform gear teeth.

70. The invention as set forth in claim 68, wherein the engaging surface includes gear teeth.

71. The invention as in claim 68, wherein the uneven surface is disposed on an upper surface of a fastening strip.

72. The invention as in claim 68, wherein the uneven surface is disposed on a side portion of fastening strip.

73. The invention as in claim 68, wherein the locking member has a first operating surface, said first operating surface and said engaging surface of the second operating surface freely engage a fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider member is between the first and second ends of a fastening strip.

74. The invention as in claim 68, wherein said engaging surface of the second operating surface restrictively engages the uneven surface of a fastening strip when the locking mechanism is in the activated position and the slider member is at one of the ends of a fastening strip so as to retain the slider member at one of the ends of a fastening strip.

75. The invention as in claim 49, wherein a fastening strip includes an uneven surface and said locking mechanism includes an element which interacts with the uneven surface to produce an audible indication of travel as the slider member moves along a fastening strip.

76. The invention as in claim 49, wherein a fastening strip includes an uneven surface and said locking mechanism includes an element which interacts with the uneven surface to produce a tactile indication of travel as the slider member moves along a fastening strip.

77. The invention as in claim 49, wherein the locking mechanism comprises a locking member having a body portion, a first end portion and a second end portion, the body portion being pivotably attached to the slider member.

78. The invention as in claim 77, wherein the end portions freely engage a fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider member is between the first and second ends of a fastening strip.

79. The invention as in claim 77, wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of a fastening strip.

80. The invention as in claim 79, wherein the body portion of the locking member is adapted to compressibly engage a fastening strip when the slider member is in the activated position so as to retain the slider member at one of the ends of a fastening strip.

81. The invention as in claim 49, wherein the locking mechanism comprises a resilient locking member,

said locking member including a body portion and an arm portion projecting outwardly therefrom, the body portion being pivotably attached to the slider member and including a second operating surface.

82. The invention as in claim 81, wherein the arm portion includes a block portion disposed at a distal end of the arm portion.

83. The invention as in claim 81, wherein the slider member includes an obstruction element, the arm portion selectively flexibly engages said obstruction element.

84. The invention as in claim 83, wherein the arm portion flexibly engages the obstruction element and freely engages a fastening strip in a substantially non-interfering manner when the locking mechanism is in the deactivated position and the slider member is between the first and second ends of a fastening strip.

85. The invention as in claim 84, wherein the second operating surface of the body portion compressibly engages a fastening strip and the arm portion disengages the obstruction element when the locking mechanism is in the deactivated position and the slider member is at one of the ends of a fastening strip so as to retain the slider member at one of the ends of a fastening strip.

86. The invention as in claim 49, wherein the locking mechanism comprises a locking member having a body portion and a first end portion.

87. The invention as in claim 86 wherein a portion of said locking member pivots with respect to the slider member.

88. The invention as in claim 87 wherein said body portion is pivotally attached to the slider member.

89. The invention as in claim 87 wherein said body portion is unitary with said slider member.

90. The invention as in claim 89 wherein said first end portion and said body portion pivot with respect to the slider member.

91. The invention as in claim 90 wherein said first end portion and said body portion pivot by biasing with respect to said slider member.

92. The invention as in claim 91 wherein said locking member has a second end portion.

93. A container comprising:

first and second sidewalls, said first and second sidewalls including mating first and second fastening strips respectively, said first and second fastening strips arranged to be interlocked over a predetermined length; and

a slider member slidably disposed on the fastening strips, the slider member facilitating the occlusion of said fastening strips when moved towards a first end thereof and for facilitating the deocclusion of said fastening strips when moved towards a second end thereof, the slider member having a locking mechanism, the

locking mechanism being movable between a deactivated position wherein the locking mechanism is disposed to move along said fastening strips and an activated position wherein the locking mechanism is disposed to engage one of said fastening strips and to restrict movement of the slider member with respect to said fastening strip.

94. The invention as in claim 93, wherein the slider member comprises a housing having a top portion, side portions, and an internal void between the side portions for receiving the fastening strips.

95. The invention as in claim 94, wherein the locking mechanism is disposed in the top portion of the housing and is adapted to engage an outward surface of said fastening strip.

96. The invention as in claim 94, wherein the locking mechanism is disposed in one of the side portions of the housing and is adapted to engage an external side portion of said fastening strip.

97. The invention as in claim 93 wherein the locking mechanism is automatically movable between the deactivated position and the activated position.

98. The invention as in claim 93, wherein the locking mechanism is manually movable between the deactivated position and the activated position.

99. The invention as in claim 93 wherein the locking mechanism is movable into the activated position

when the slider member is at one of the ends of said fastening strip.

100. The invention as in claim 93 wherein the locking mechanism is movable into the activated position when the slider member is between the ends of said fastening strip.

101. A method for using a closure device comprising the steps of:

providing a first interlocking fastening strip,

providing a second interlocking fastening strip,

providing a slider member slidably disposed on the fastening strips, the slider member facilitating the occlusion of said fastening strips when moved towards a first end thereof and facilitating the deocclusion of said fastening strips when moved towards a second end thereof,

providing a locking mechanism, said locking mechanism being movable between a deactivated position wherein the locking mechanism is disposed to move along said fastening strips and an activated position wherein the locking mechanism is disposed to engage one of said fastening strips and to restrict movement of the slider member with respect to said fastening strip,

activating said locking mechanism to achieve the activated position wherein the locking mechanism is disposed to engage one of said fastening strips and to restrict movement of the slider member with respect to said fastening strip.

102. The invention as in claim 101, wherein the slider member comprises a housing having a top portion,

side portions, and an internal void between the side portions for receiving the fastening strips.

103. The invention as in claim 102, wherein the locking mechanism is disposed in the top portion of the housing and is adapted to engage an outward surface of said fastening strip.

104. The invention as in claim 102, wherein the locking mechanism is disposed in one of the side portions of the housing and is adapted to engage an external side portion of said fastening strip.

105. The invention as in claim 101 wherein the locking mechanism is automatically movable between the deactivated position and the activated position.

106. The invention as in claim 101, wherein the locking mechanism is manually movable between the deactivated position and the activated position.

107. The invention as in claim 101 wherein the locking mechanism is movable into the activated position when the slider member is at one of the ends of said fastening strip.

108. The invention as in claim 101 wherein the locking mechanism is movable into the activated position when the slider member is between the ends of said fastening strip.

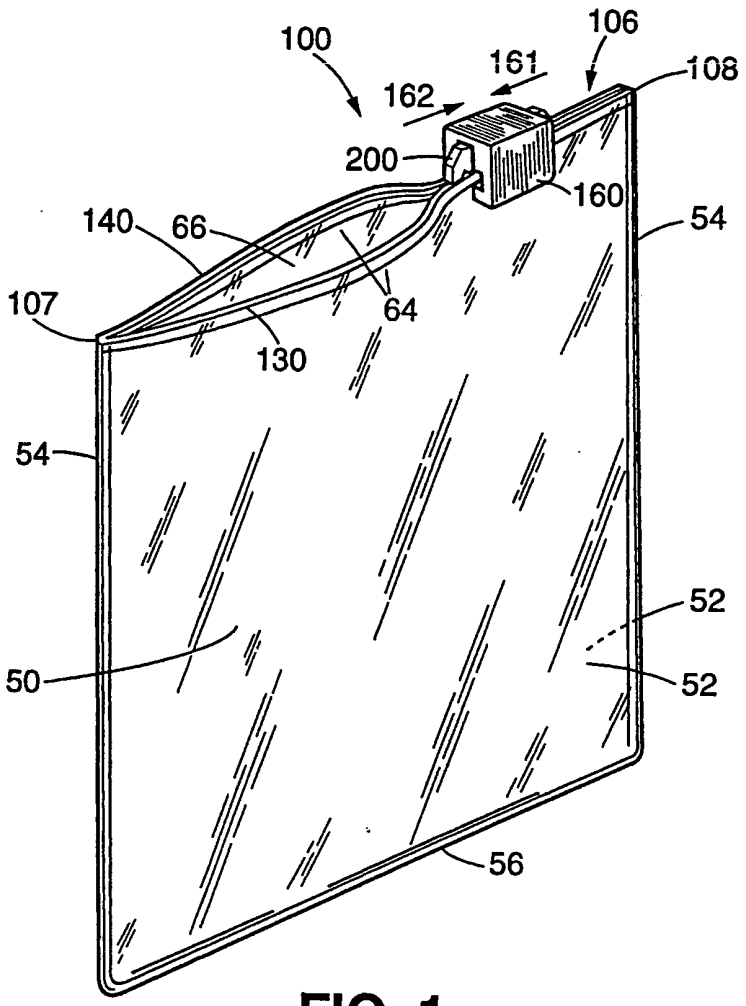
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FIG. 1

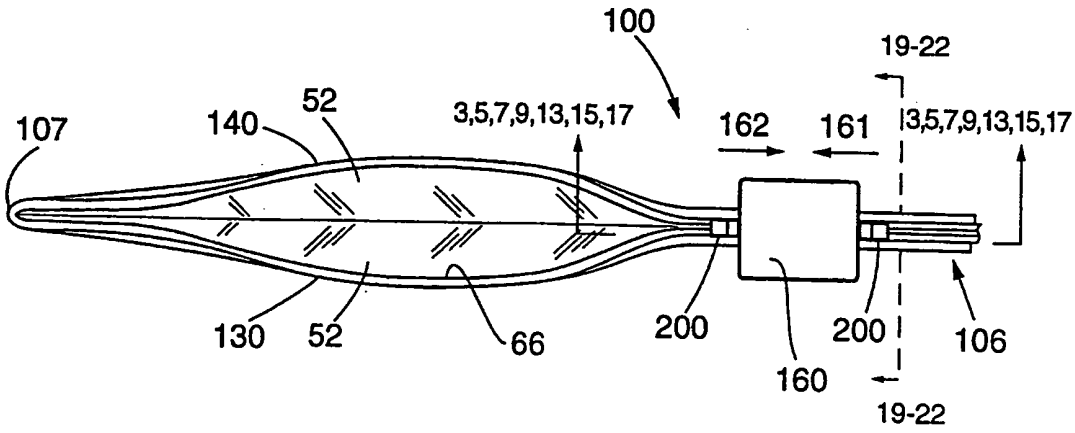
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FIG. 2

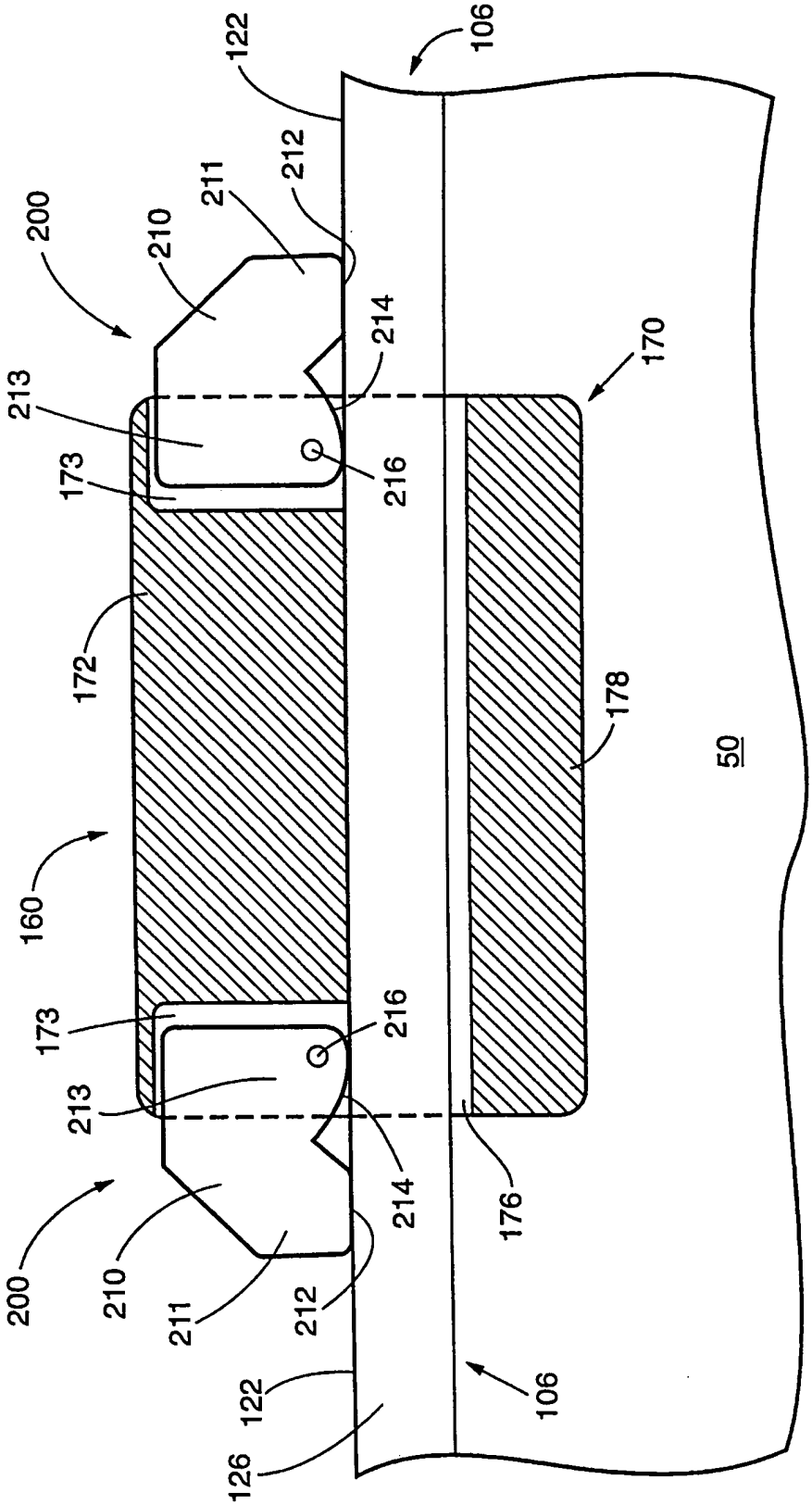
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FIG. 3

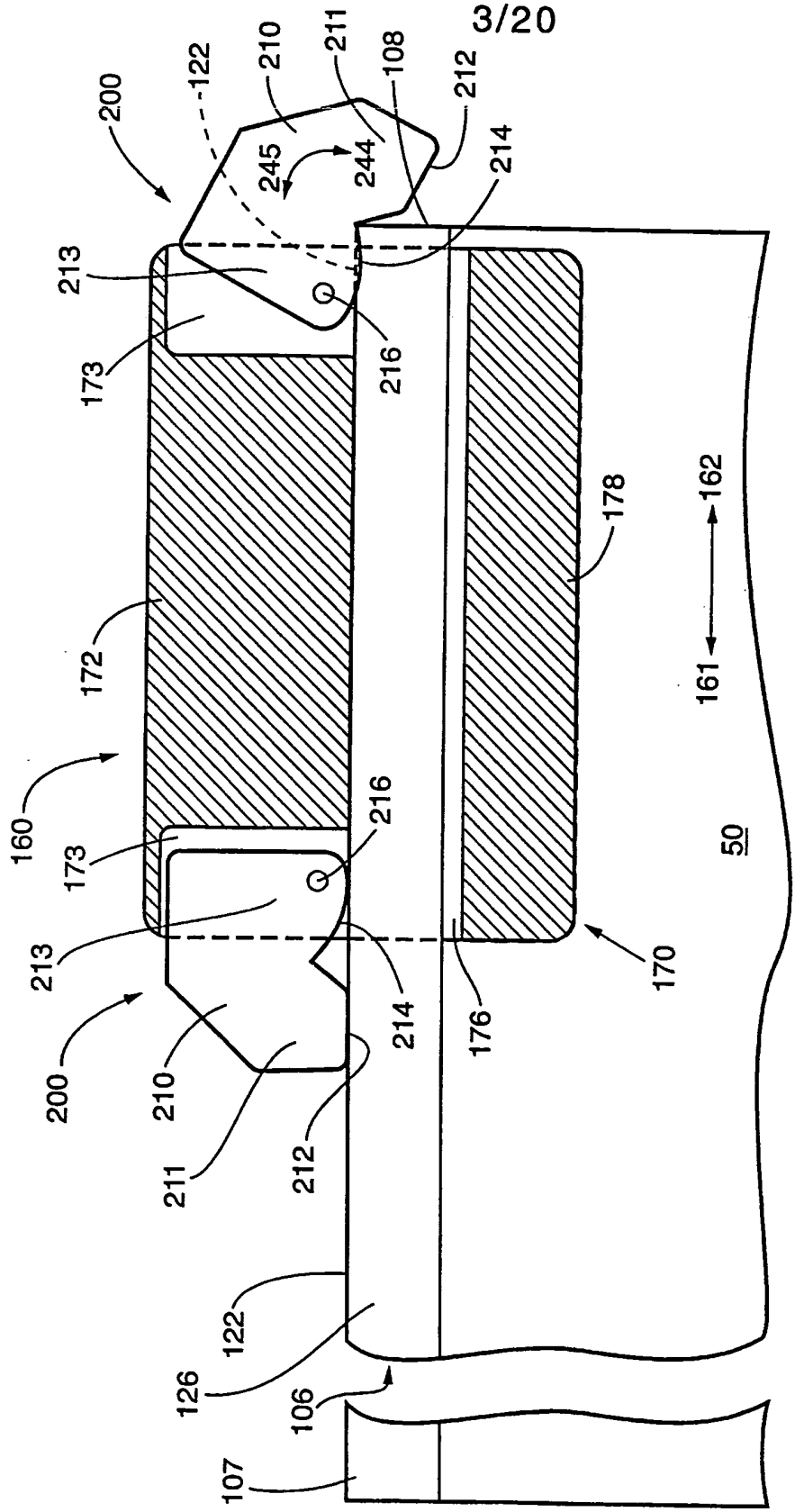
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FIG. 4

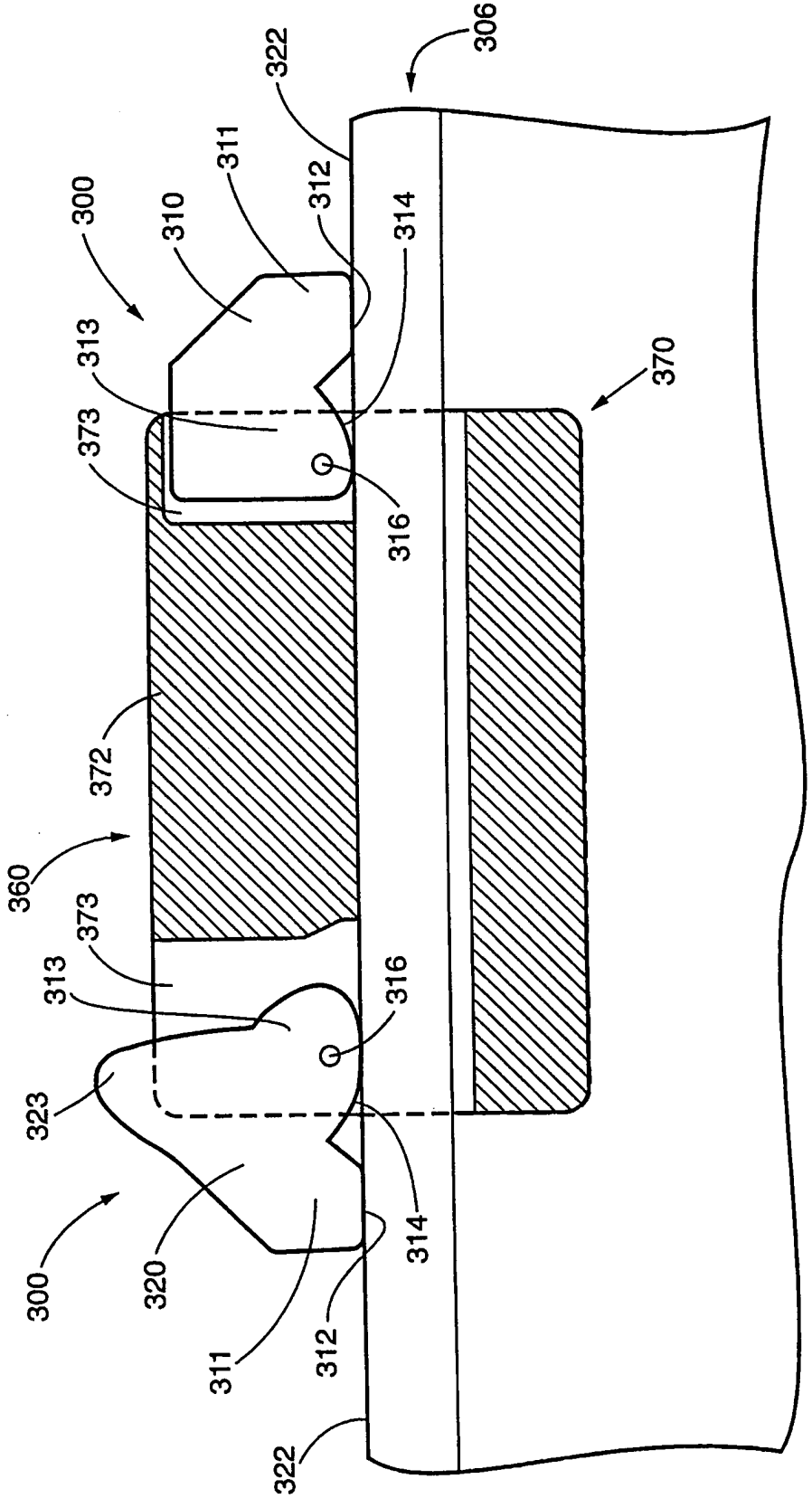
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FIG. 5

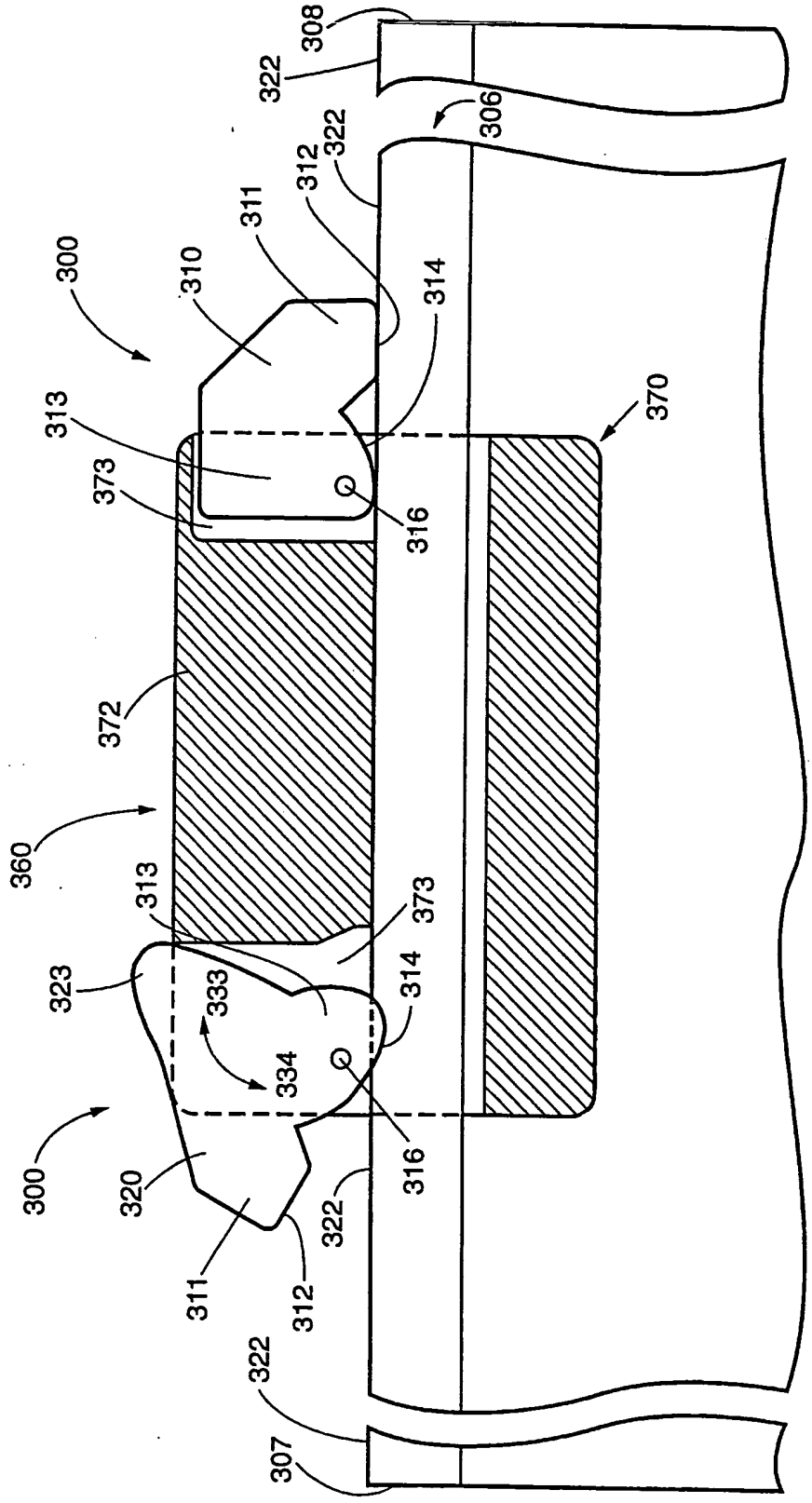
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FIG. 6

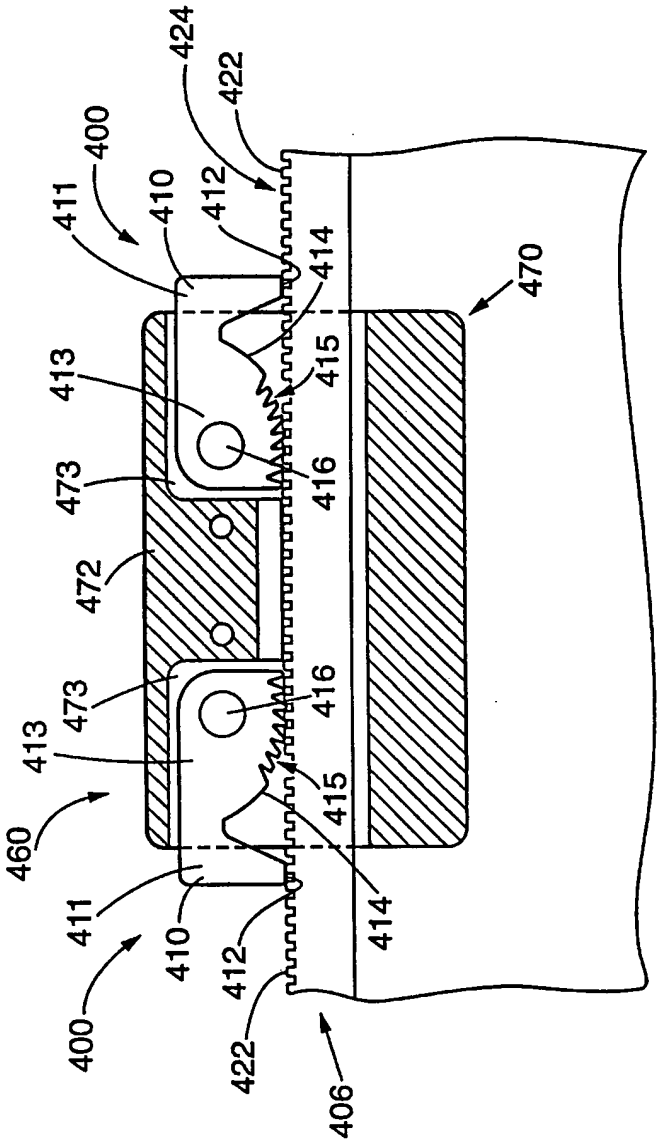
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FIG. 7

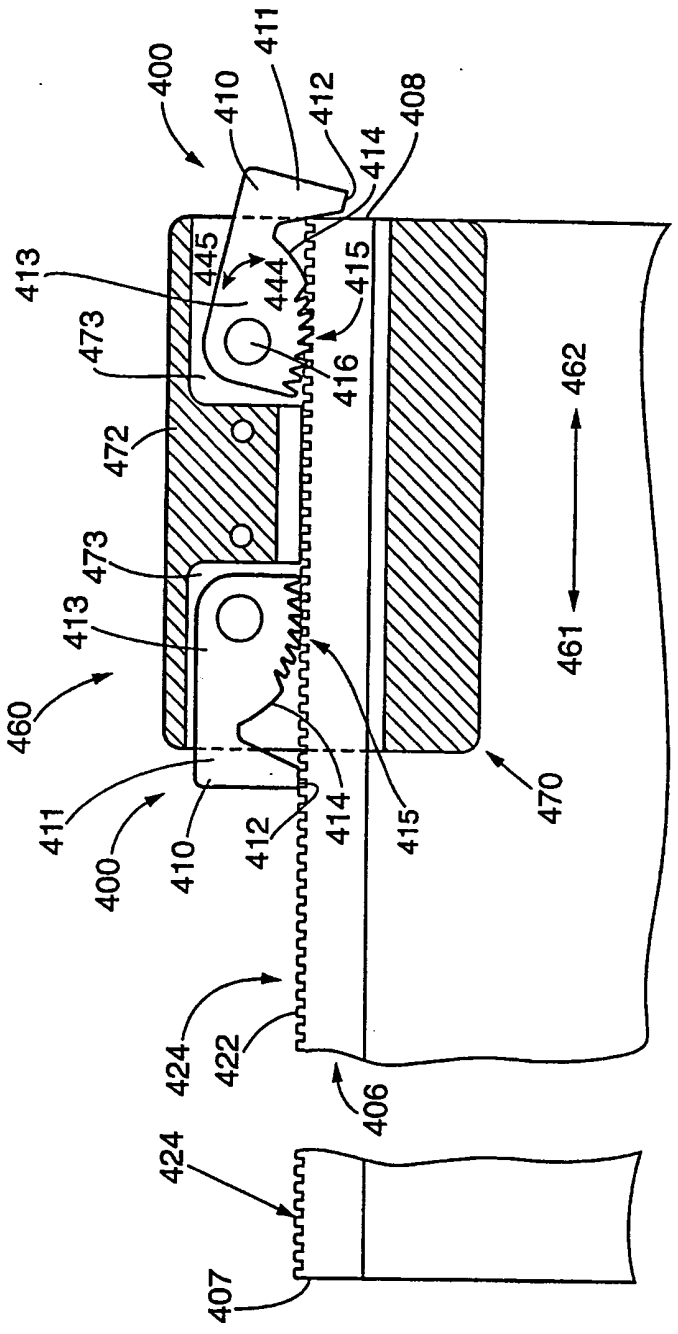
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FIG. 8

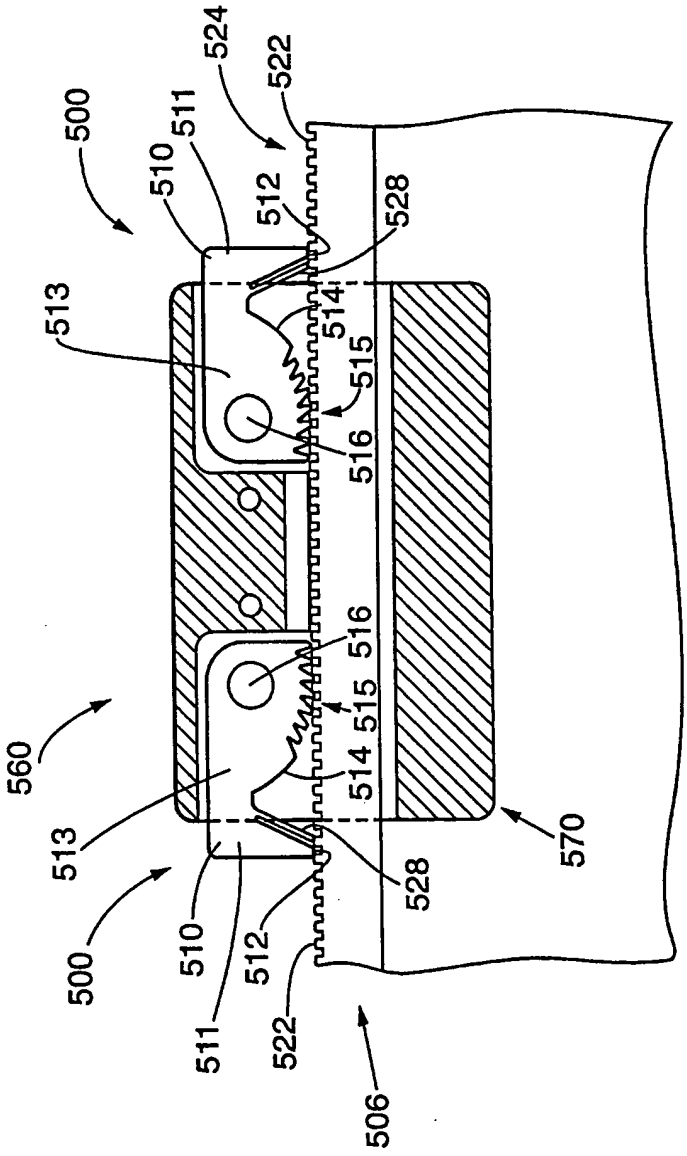
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FIG. 9

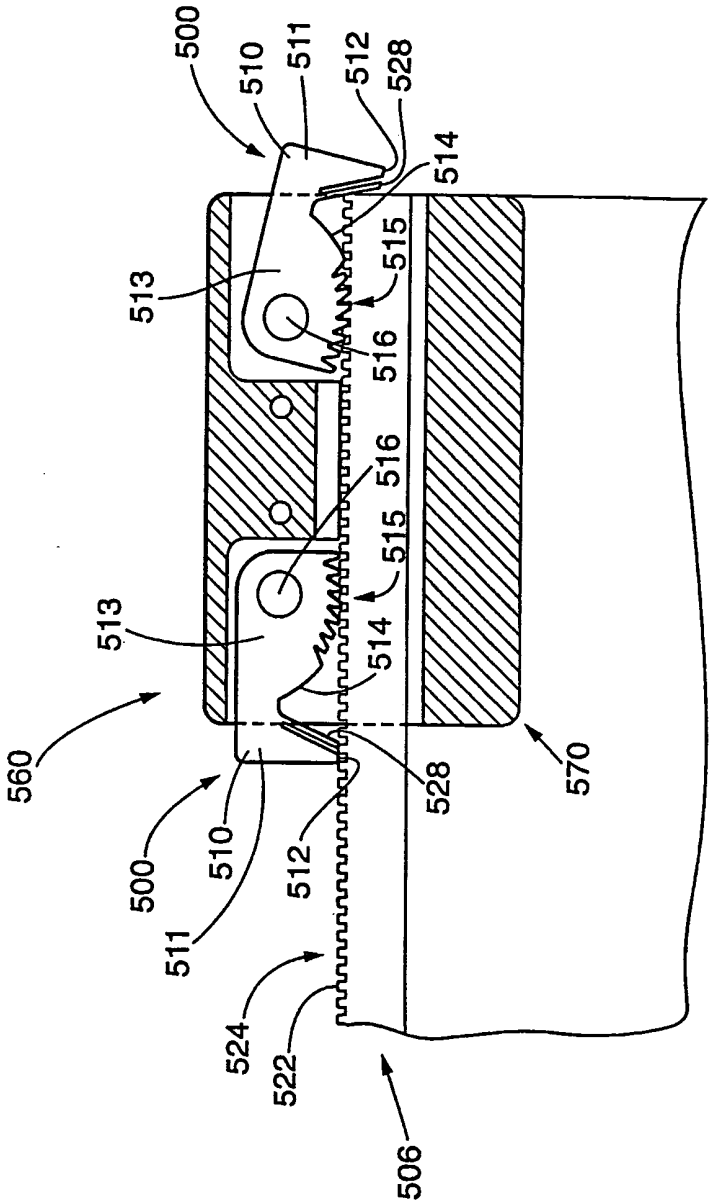
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FIG. 10

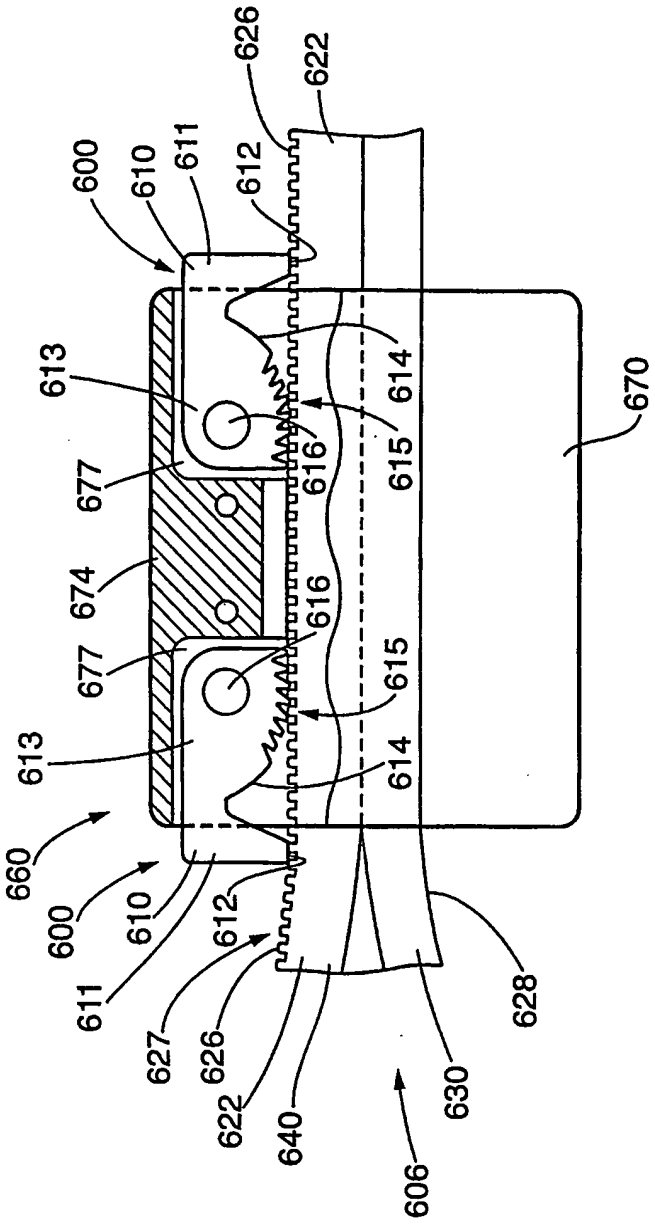
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FIG. 11

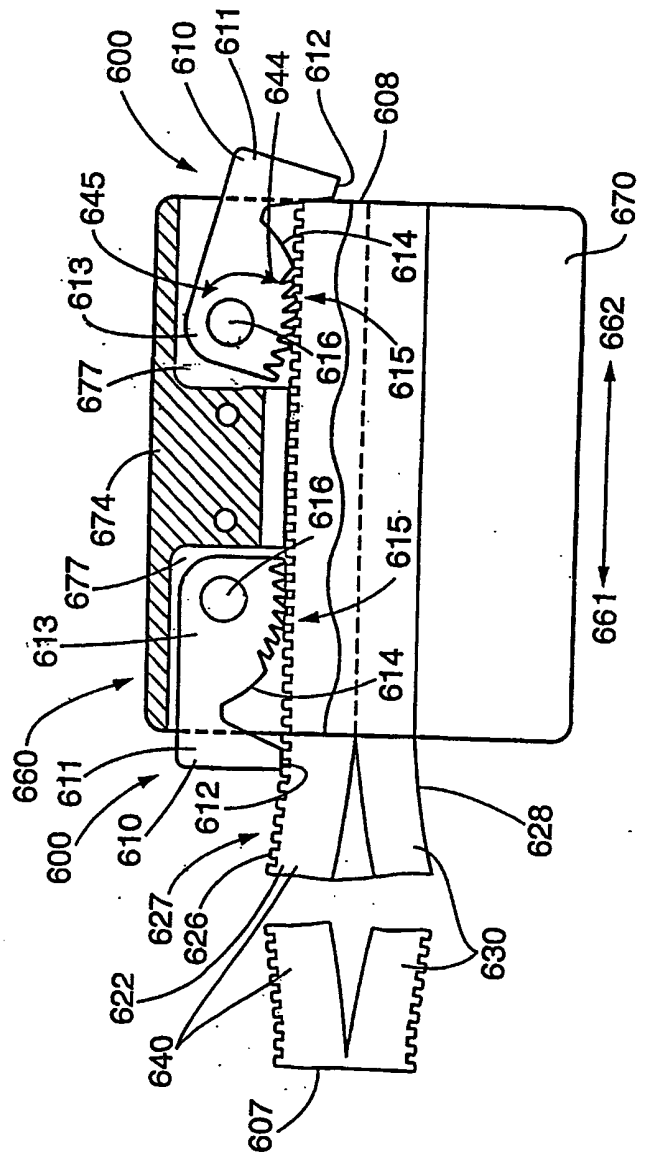
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FIG. 12

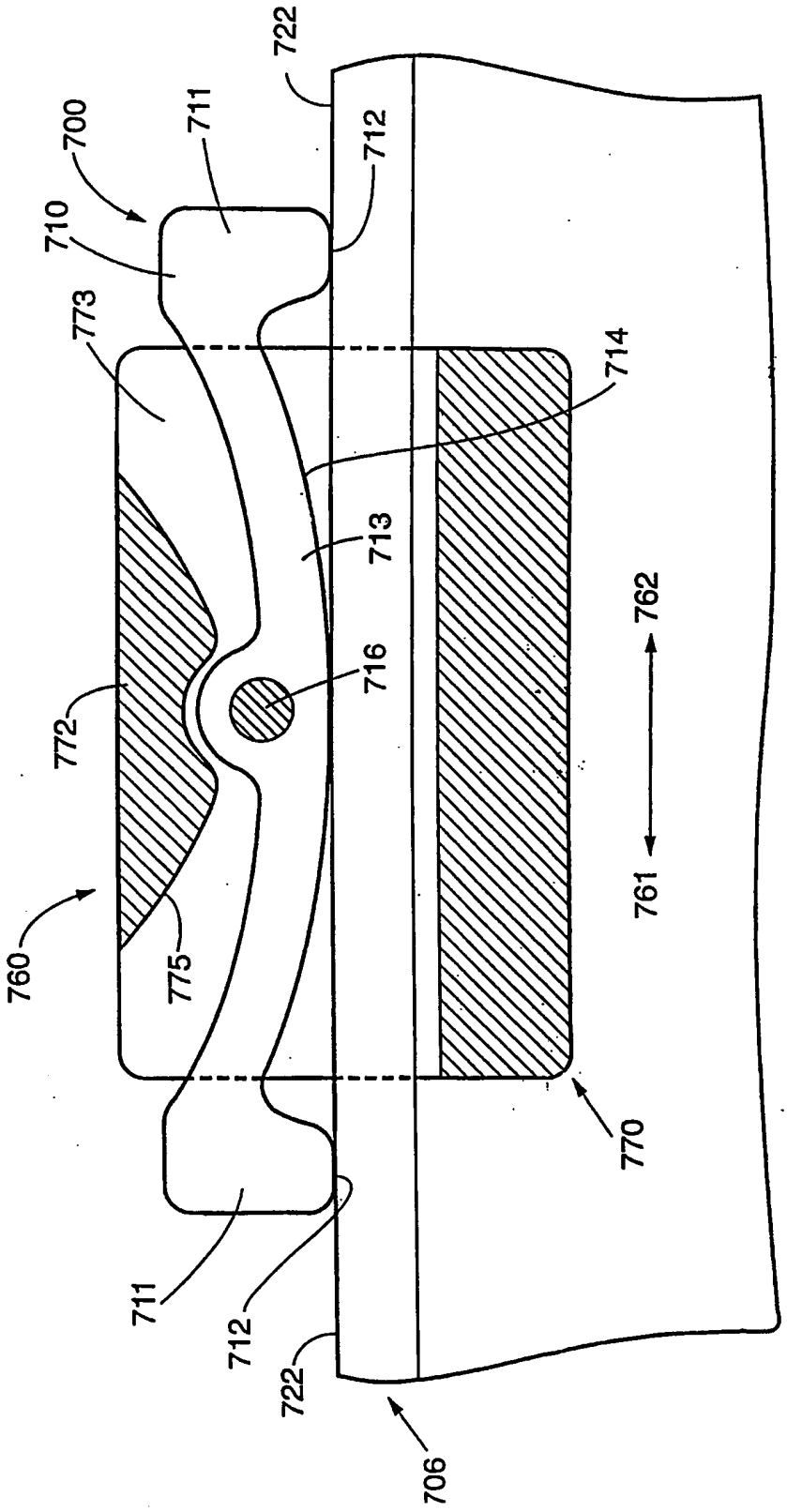
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FIG. 13

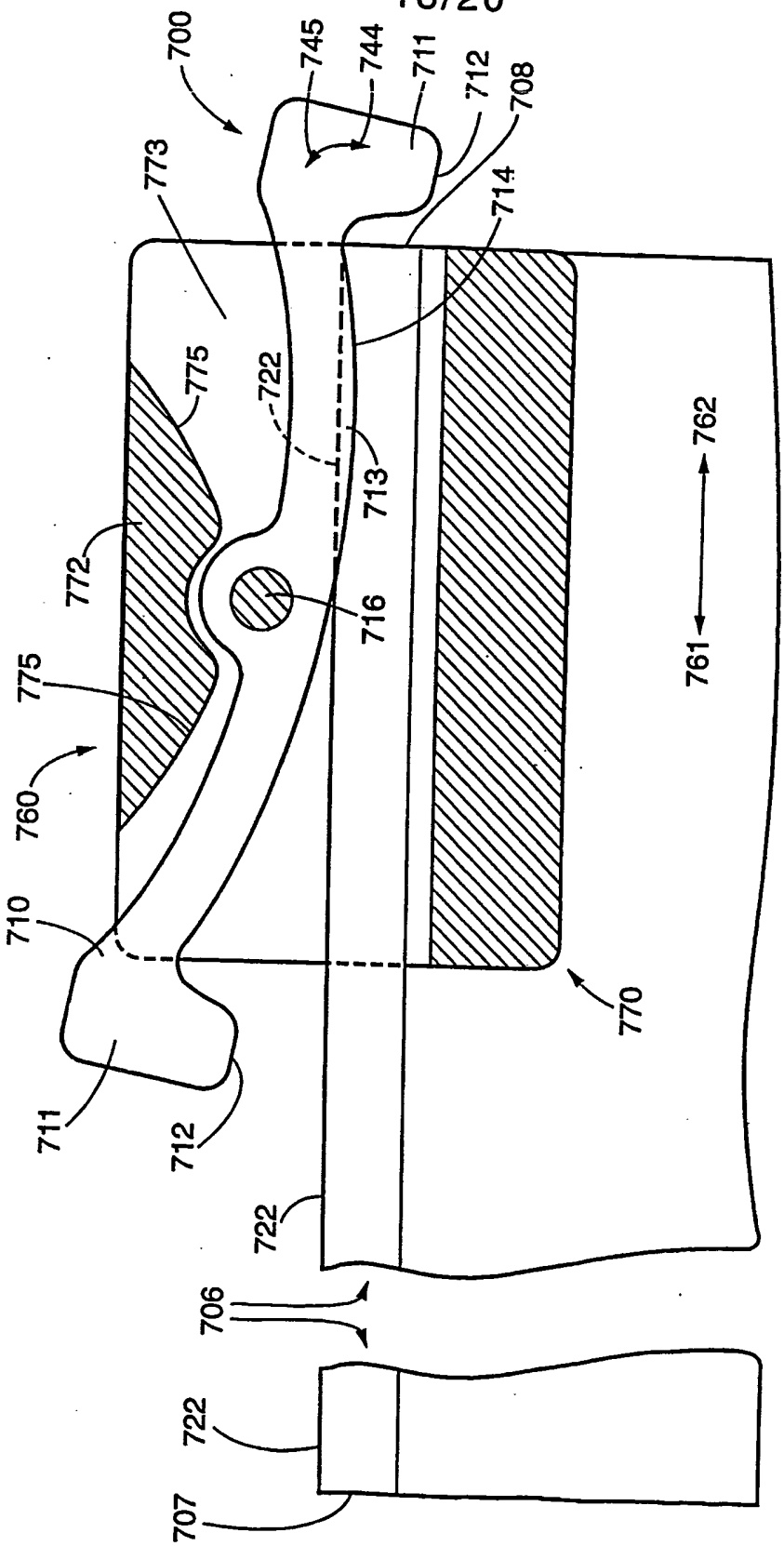
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FIG. 14

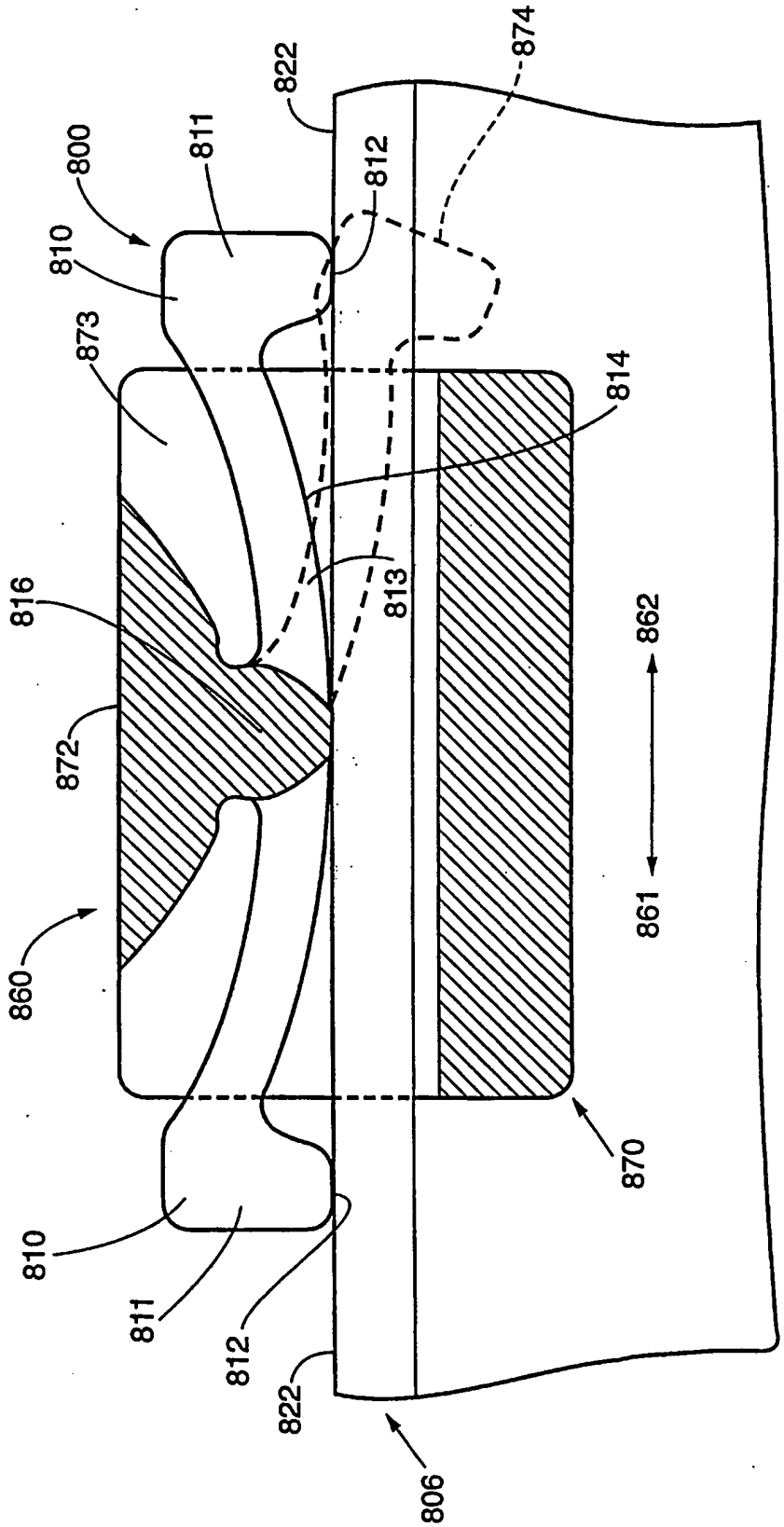
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FIG. 15

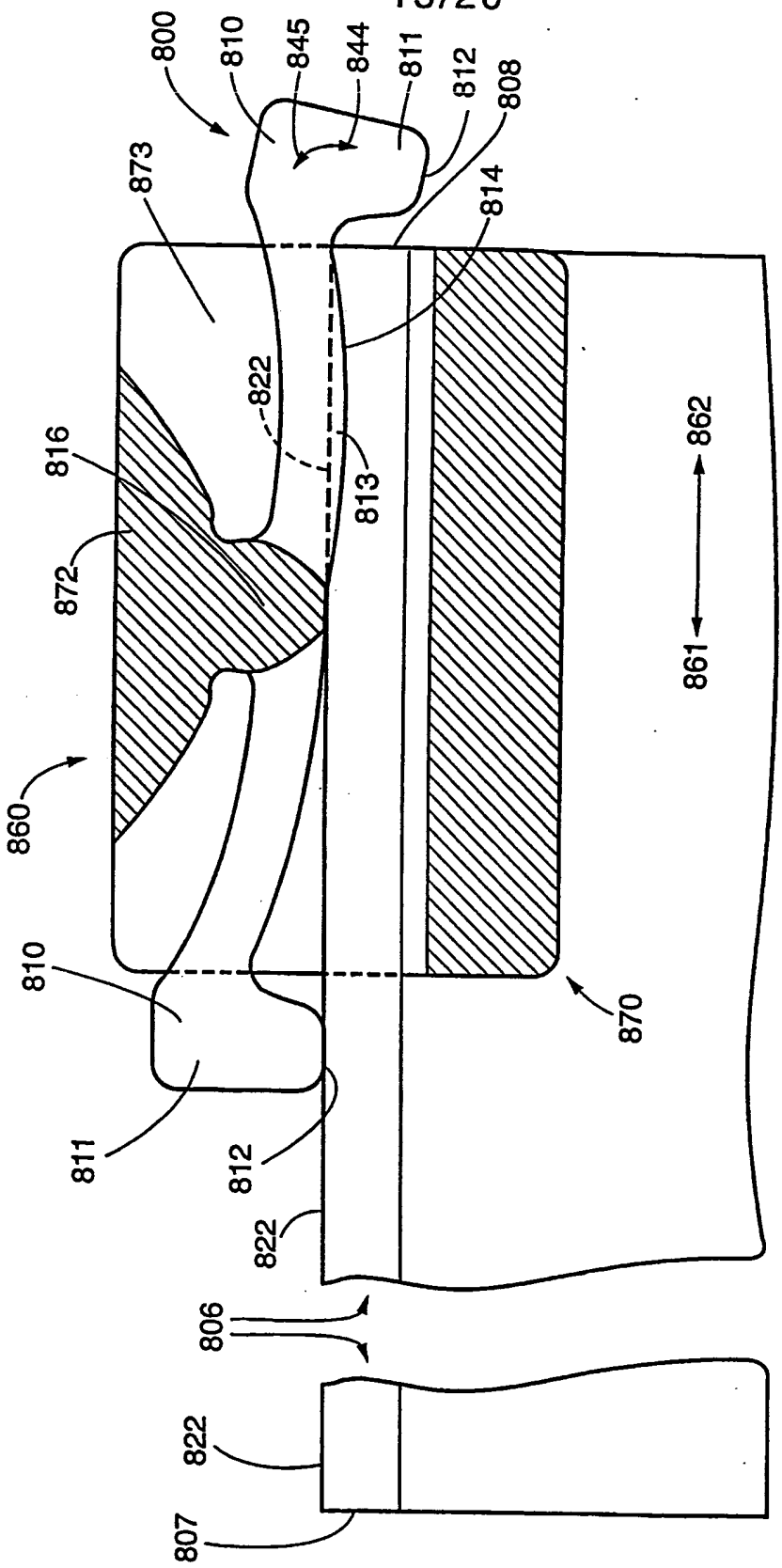
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FIG. 16

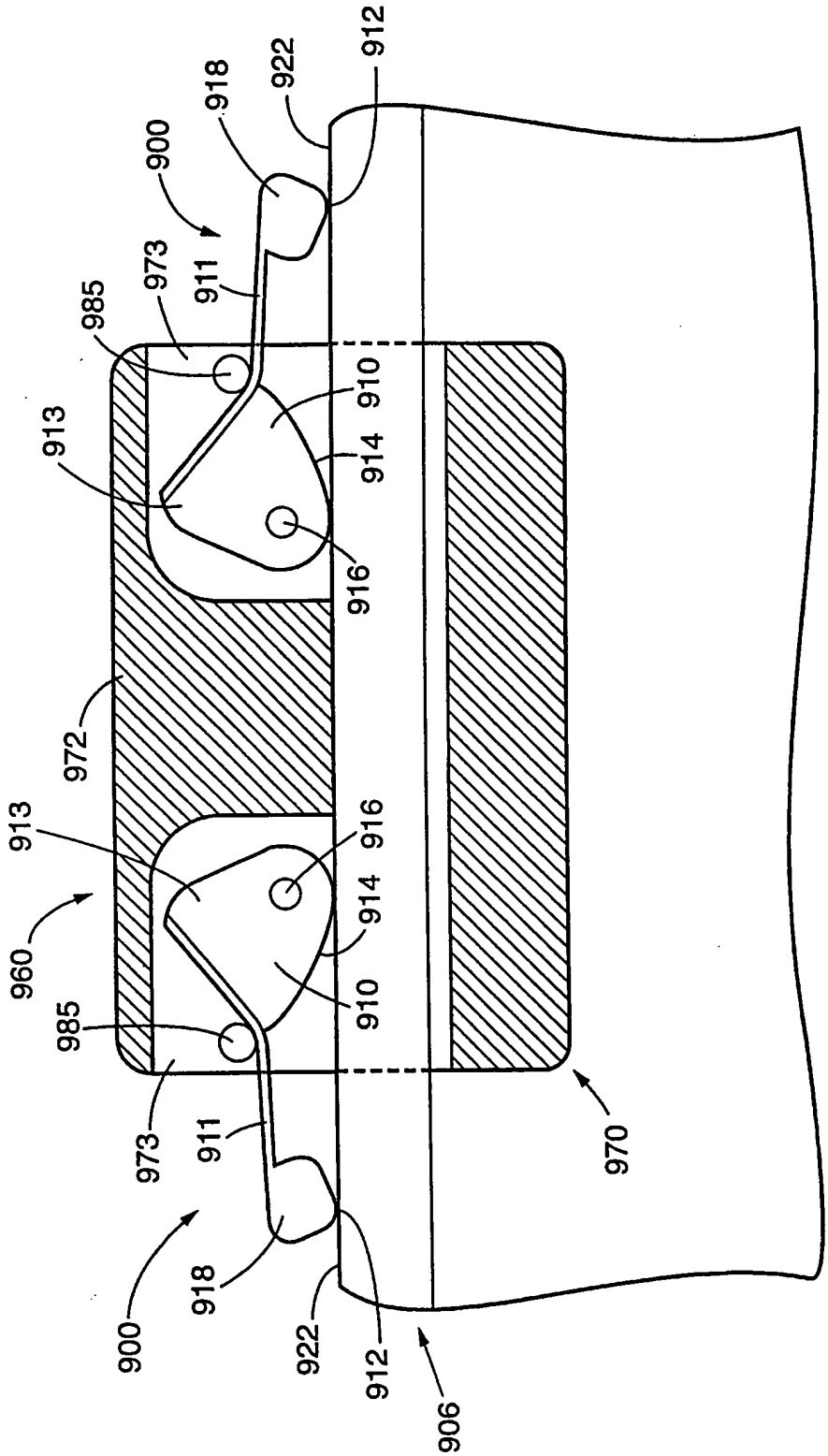

FIG. 17

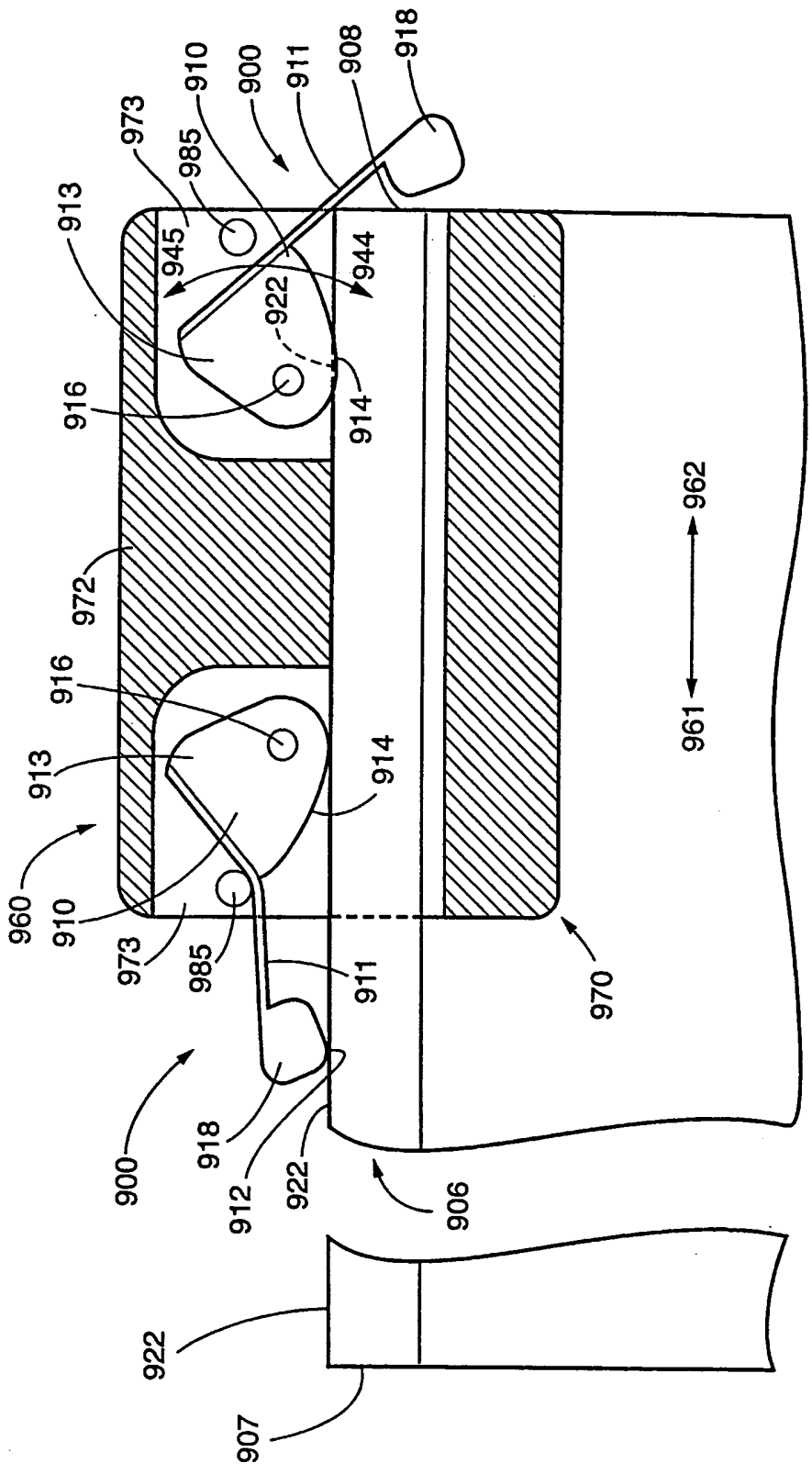
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FIG. 18

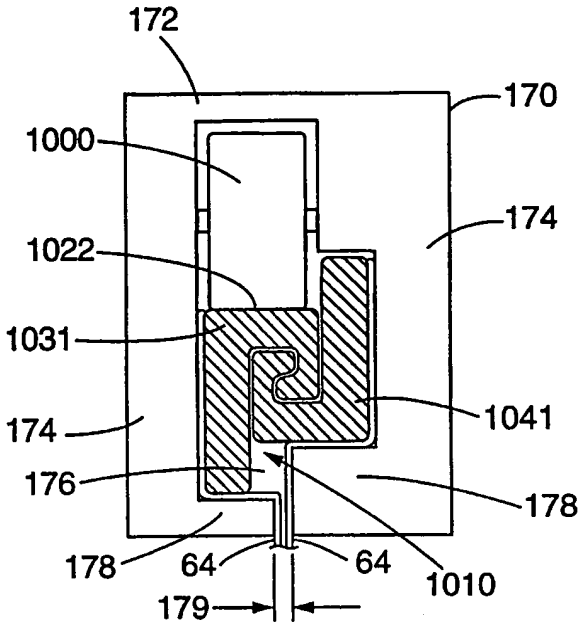

FIG. 19

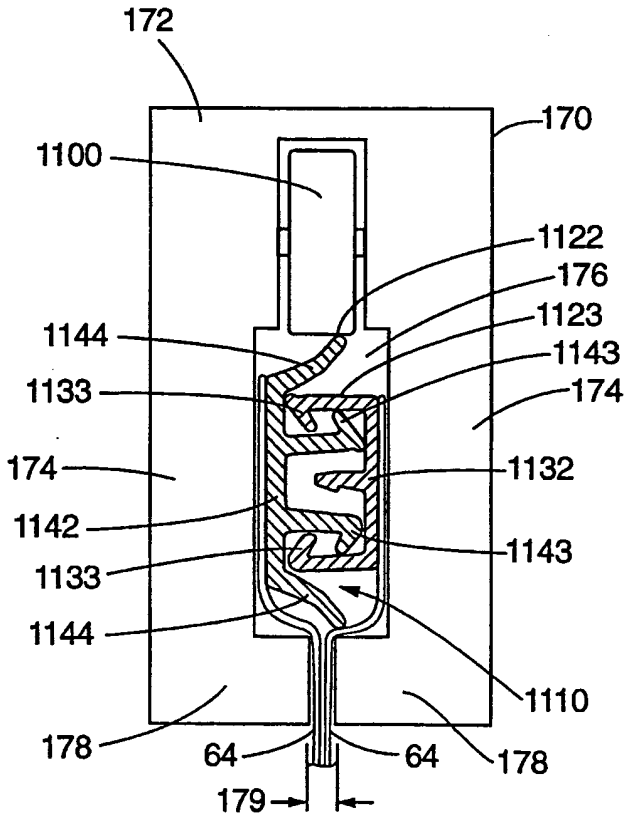
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FIG. 20

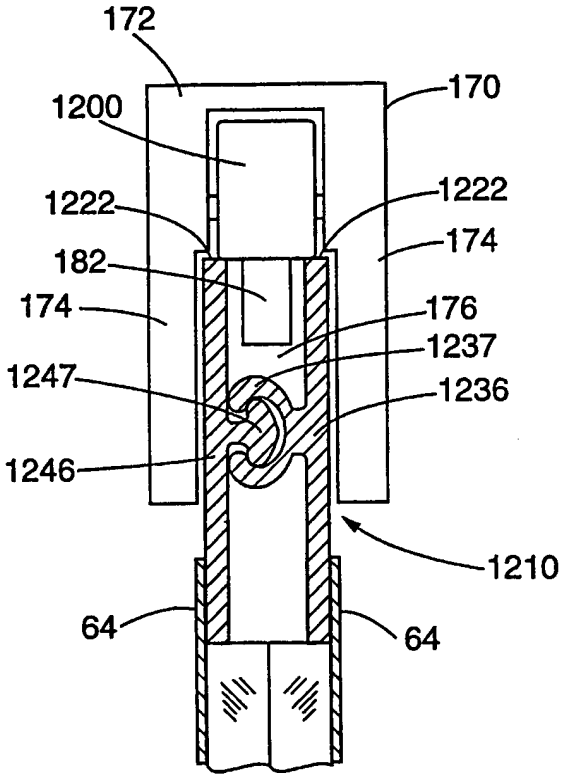
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FIG. 21

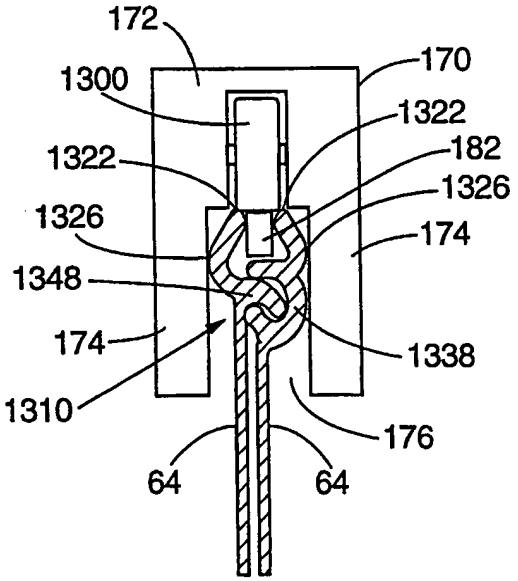
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FIG. 22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/13220

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :A44B 19/30
US CL :24/400, 415, 418
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 24/400, 415, 418, 419, 435, 436, 587, 399, 420-424; 383/63, 211

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,632,070 A (WAKABAYASHI) 27 May 1997, see entire document.	1-4, 6-11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 29,31-40, 42, 49-52, 54, 59, 61, 63, 68, 71, 77, 79, 86-88, 93-96, 98-104, 106 and 108
Y	US 5,283,932 A (RICHARDSON et al.) 8 Feruary 1994, see entire document.	45-48
A	US 5,896,627 A (CAPPEL et al.) 27 April 1999, see entire document.	1-108

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
19 AUGUST 1999

Date of mailing of the international search report
21 OCT 1999

Name and mailing address of the ISA/US
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Washington, D.C. 20231
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Telephone No. (703) 308-2168

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/13220

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,806,151 A (UCHIYAMA) 15 September 1998, see entire document.	1-4, 6-11, 13, 15, 17, 19, 20, 23, 24, 26, 28, 29, 31, 38-40, 42, 49-52, 54, 59, 61, 63, 68, 71, 77, 79, 86-88, 93-96, 98-104, 106 and 108